TOSHIBA

UNINTERRUPTIBLE POWER SYSTEM (UPS)

G8000 SERIES

with Isolated Output

INSTALLATION and
OPERATION MANUAL

Document: 59942-001
November 2007

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The Toshiba products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These Toshiba products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability; nor are they intended to be used in equipment that, if a malfunction or failure occurs, may result in loss of human life or bodily injury (collectively referred to as “Unintended Usage”). Unintended Usage includes atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical operating room or life support equipment, all types of safety devices, etc. Unintended Usage of Toshiba products listed in this document shall be made at the customer’s own risk.

NOTICE

PLEASE INFORM TOSHIBA INTERNATIONAL CORPORATION OR AUTHORIZED REPRESENTATIVE IN CASE OF INCONSISTENCIES, OMISSIONS, OR QUESTIONS.

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, nor to provide for every possible contingency concerning installation, operation, or maintenance. Should further information be required or if problems arise which are not covered sufficiently contact your Toshiba sales office.

The contents of this instruction manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Toshiba International Corporation’s UPS Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation’s UPS Division and any statements contained herein DO NOT create new warranties or modify the existing warranty.

Any electrical or mechanical modifications to this equipment without prior written consent of Toshiba International Corporation will void all warranties and may void the UL/CUL listing. Unauthorized modifications can also result in personal injury, death, or destruction of the equipment.

QUALIFIED PERSONNEL ONLY

Qualified Personnel is one that has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

UNINTERRUPTIBLE POWER SYSTEM (UPS)

Please complete the following information and retain for your records.

Unless otherwise specified, the warranty period for the UPS or UPS part is 12 months from the shipment date (see Toshiba International Corporation bill of lading).

Unless otherwise specified, the warranty period for a UPS battery is 36 months from the shipment date (see Toshiba International Corporation Bill of Lading for shipping date).

JOB NUMBER _____

MODEL NUMBER _____

SERIAL NUMBER _____

APPLICATION _____

SHIPMENT DATE _____

INSTALLATION DATE _____

INSPECTED BY _____

Purpose

This manual provides information on how to safely operate your Toshiba International Corporation power electronics product. This manual includes a section of general safety instructions that describes the warning labels and symbols that are used throughout the manual. Read the manual completely before installing, operating, or performing maintenance on this equipment.

This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English customary equivalent.

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Toshiba's Customer Support Center

Contact the Toshiba Customer Support Center for assistance with application information or for any problems that you may experience with your Uninterruptible Power System, (UPS).

Toshiba Customer Support Center
8 a.m. to 5 p.m. (CST) - Monday through Friday
USA Toll Free (877) 867-8773
Tel (713) 466-0277
Fax (713) 896-5212

You may also contact Toshiba by writing to:

Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041-9990
Attn: UPS Product Manager

For further information on Toshiba's products and services, please visit our website at:

www.toshiba.com/ind

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1 Introduction

This manual provides information on how to safely operate your G8000 Series Uninterruptible Power System (UPS). This manual includes a section of general safety instructions that describes the warning labels and symbols that are used throughout the manual. Read the manual completely before installing, operating, or performing maintenance on this equipment.

Qualified personnel should read this manual carefully before transporting, installing and wiring the UPS. In addition have a thorough understanding of the information provided in the chapters titled:

- General Safety Instructions
- Important Safety Instructions
- Safety Precautions
- Installation Precautions

Please read the G8000 Series Operation Manual for important instructions on operating the UPS. This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English customary equivalent.

Keep the Installation Manual and the Operation Manual near the UPS for necessary reference.

SAVE THESE INSTRUCTIONS

2 General Safety Instructions

DO NOT attempt to transport, install, operate, maintain or dispose of this equipment until you have read and understood all of the product safety information provided in this manual.

2.1 Symbols

The symbols listed below are used throughout this manual. When symbols are used in this manual they will include important safety information that must be carefully followed.

Safety Alert Symbol indicates that a potential personal injury hazard exists.

Prohibited Symbol indicates **DO NOT** take action.

Mandatory Symbol indicates that the following instruction is required.

Ground Symbol indicates the location of the equipment grounding conductor.

Electrical - Voltage & Shock Hazard Symbol indicates parts inside may cause electric shock.

Explosion Hazard Symbol indicates parts may explode.

2.2 Signal Words

The signal words listed below are used throughout this manual. When the words DANGER, WARNING, CAUTION and ATTENTION are used in this manual they will include important safety information that must be carefully followed.

DANGER

The word **DANGER** in capital letters preceded by the safety alert symbol indicates that an **imminently hazardous** situation exists, if not avoided, **will result in death or serious injury to personnel.**

WARNING

The word **WARNING** in capital letters preceded by the safety alert symbol indicates that a **potentially hazardous** situation exists, if not avoided, **could result in death or serious injury to personnel.**

CAUTION

The word **CAUTION** in capital letters preceded by the safety alert symbol indicates that a **potentially hazardous** situation exists, if not avoided, **may result in minor or moderate injury.**

CAUTION

The word **CAUTION** in capital letters without the safety alert symbol indicates a **potentially hazardous** situation exists, if not avoided, **may result in equipment and property damage.**

ATTENTION

The word **ATTENTION** in capital letters without the safety alert symbol indicates a **potentially hazardous** situation exists, if not avoided, **may result in equipment and property damage.**

2.3 Qualified Personnel

Installation, operation, and maintenance shall be performed by Qualified Personnel Only. A Qualified Person is one that has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

Qualified Personnel shall:

- Have read the entire operation manual.
- Be familiar with the construction and function of the ASD, the equipment being driven, and the hazards involved.
- Able to recognize and properly address hazards associated with the application of motor-driven equipment.

- Be trained and authorized to safely energize, de-energize, ground, lockout/tagout circuits and equipment, and clear faults in accordance with established safety practices.
- Be trained in the proper care and use of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- Be trained in rendering first aid.

For further information on workplace safety visit www.osha.gov.

2.4 Factory Authorized Personnel

Factory authorized personnel have been factory trained and certified to install, service, and repair the UPS. Contact the Toshiba Customer Support Center for assistance in locating the factory authorized personnel nearest you.

3 Important Safety Instructions

The following contains important instructions that should be followed during the installation, operation, and maintenance of the G8000 Series UPS.

Please refer to the battery manufacturer's instructions for details on operating, maintaining and/or replacing the batteries for each system. Unauthorized personnel from batteries. Only a factory authorized representative with battery experience should perform service on batteries.

CAUTION

Misuse of this equipment could result in personal injury and/or equipment damage. In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment.

The UPS system input and output is NOT equipped with an over-current protection device, or an output disconnection at the AC output. The user should provide circuit breakers between the UPS AC input (or Bypass input) and the power sources and between the UPS output and the critical load input. The minimum device ratings are listed in Table 3.1.

TABLE 3.1 UPS MINIMUM DEVICE RATINGS

Capacity	Rated Output	Input Breaker Rating	Output Breaker Rating
100 kVA	208/120 Vac	480V-200 A	208V-350 A
150 kVA	208/120 Vac	480V-250 A	208V-600 A

The maximum operating ambient temperature should be 40 °C (104 °F). If the UPS is exposed to the same ambient temperature as the battery system, the maximum operating ambient temperature should be 32 °C (90 °F). Table 3.2 lists the nominal battery voltage.

TABLE 3.2 UPS NOMINAL BATTERY VOLTAGE

Capacity	Nominal Voltage	Float Voltage
100 kVA	360 Vdc	405 V
150 kVA	360 Vdc	405 V

4 Safety Precautions

The Toshiba products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These Toshiba products are neither intended nor warranted for use in equipment that, if a malfunction or failure occurs, may result in loss of human life or bodily injury (collectively referred to as “Unintended Usage”). Unintended Usage includes atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical operating room or life support equipment, all types of safety devices, etc. Unintended Usage of Toshiba products listed in this document shall be made at the customer’s own risk.

The application of the UPS without special consideration for equipment that supports human safety and/or maintain public services may cause serious accidents.

4.1 Disclaimer

IN NO EVENT WILL TOSHIBA CORPORATION BE RESPONSIBLE OR LIABLE FOR EITHER INDIRECT OR CONSEQUENTIAL DAMAGE OR INJURY THAT MAY COME FROM THE USE OF THIS EQUIPMENT. ANY MODIFICATIONS WITHOUT AUTHORIZATION BY TOSHIBA COULD RESULT IN PERSONAL INJURIES, DEATH OR DESTRUCTION OF THE UPS.

TOSHIBA RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. TOSHIBA DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR UPS DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

4.2 General Maintenance

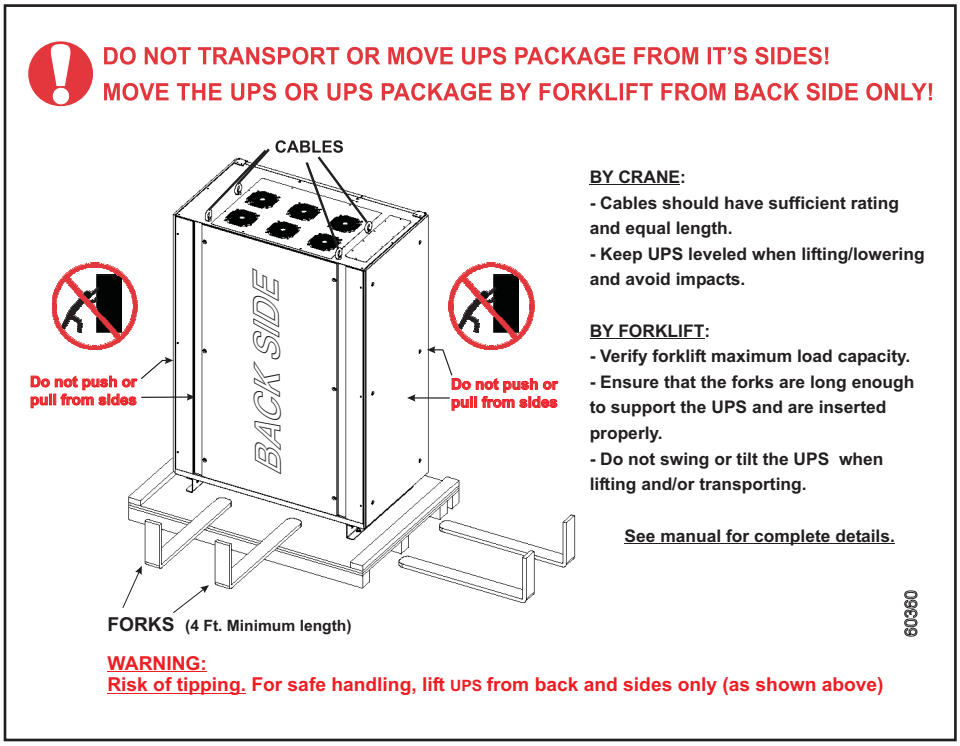
WARNING	
	DO NOT remove the rear/side panels, or any sheet metla not designed to be removed. Removing rear/side panels may result in electric shock, burns, personal injuries or UPS failure.
	Keep the area arround the UPS clean. Use a vacuum cleaner to clean the UPS.
	Only factory authorized personnel sould perform internal general maintenance on the UPS.
	Contact the authorized Toshiba Customer Support Center or an authorized Toshiba representative for informaton on proper disposal of UPS components. It is illegal to dispose of certain components without conforming to environmental regulations for indusrial/commercial waste.

4.3 Transporting/Unpacking

WARNING	
When transporting the UPS by crane, follow the SPECIFIED WORK PROCEDURE. The suspension wire angle should be less than 60°. The UPS falling or overturning may cause crushing, trapping or other personal injuries. *See Installation Manual: Chapter 8 - Transporting*	
	DO NOT tilt the UPS more than 10° from upright position. Tilting the UPS more than 10° may cause crushing, trapping or other personal injuries.

CAUTION	
	DO NOT transport, move, store, or place the UPS on its side. Forces due to heavy components inside may damage the UPS.
	Avoid vibration or shock exceeding 0.5G. Failing to observe this precaution may cause damage to the UPS.
	DO NOT allow the UPS to suffer shock or impact when unpacking. Tools used to remove packaging materials may cause damage to the UPS.
	DO NOT push or pull on the sides of the packaging.or the UPS to move it. Always use a crane, forklift, or pallet jack for transporting and positioning the UPS. Pushing/pulling on the sides of the unit to move it may result in damage to the UPS. See Figure 4.1 Exterior Handling label.

Fig. 4.1 Exterior Handling label


DO NOT TRANSPORT OR MOVE UPS PACKAGE FROM IT'S SIDES!
MOVE THE UPS OR UPS PACKAGE BY FORKLIFT FROM BACK SIDE ONLY!
CABLES
BACK SIDE
Do not push or pull from sides
Do not push or pull from sides
FORKS (4 Ft. Minimum length)
BY CRANE:
- Cables should have sufficient rating and equal length.
- Keep UPS leveled when lifting/lowering and avoid impacts.
BY FORKLIFT:
- Verify forklift maximum load capacity.
- Ensure that the forks are long enough to support the UPS and are inserted properly.
- Do not swing or tilt the UPS when lifting and/or transporting.
See manual for complete details.
60360
WARNING:
Risk of tipping. For safe handling, lift UPS from back and sides only (as shown above)

4.4 Inspection/Storage

Inspection

Upon receipt of the UPS, an inspection for shipping damage should be performed. Use caution when removing the unit from the pallet. Refer to labels or documentation attached to packing material.

Unpacking

Check the unit for loose, broken, bent or otherwise damaged parts. If damage has occurred during shipping, keep all original crating and packing materials for return to the shipping agent.

NOTE: The factory warranty does not apply to damage incurred during shipping!

Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.

Storage

During periods of non-use, the following guidelines are recommended for storage.

Storage Preparation

- Place the MCCB switch in the “OFF” position.

Storage Conditions

- For best results, store the UPS in the original shipping container and place on a wood or metal pallet
- Storage temperature range: -4 to 95 °F (-20 to 35 °C)
- Maximum storage time for the UPS between powered operation cycles is three years. If the UPS has been stored for a period exceeding 36 months, contact your factory authorized represnetative of guidance in starting the unit.

Avoid the following storage locations:

- Locations that are subject to extreme temperature changes or high humidity
- Locations that are subject to high levels of dust or metal particles
- Locations that are subject to excessive vibration
- Inclined floor surfaces

5 Installation Precautions

CAUTION	
	Install the UPS in a controlled environment. Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions. *See Table 5.1 - UPS Installation Environment Standards*
	DO NOT tilt the UPS more than 10° from upright position. Tilting the UPS more than 10° may cause crushing, trapping or other personal injuries and cause physical damage to internal components.

WARNING	
	Keep the SPECIFIED CLEARANCE around the UPS. Inadequate space around the UPS makes it difficult to perform maintenance/inspections, will lead to insufficient ventilation, and/or cause malfunctions.
	Install anchor bolts to secure the UPS to the installation floor. The UPS may fall during an earthquake if the anchor bolts are not installed and secured.
	Only factory authorized personnel should relocate, modify, or replace parts in the UPS after initial installation. Electrical shock, injury or UPS failure may occur if non-authorized technicians attempt to modify or relocate the UPS. Please contact Toshiba Customer Support Center if you plan to move or make modifications to the UPS

	DO NOT block air vents. Blocking the vents will increase the internal temperatures and may result in UPS failure or fire.
	DO NOT install the UPS where water may fall on it. Water may cause electrical shock, personal injury or UPS failure.
	DO NOT use floor wax that contains silicon in the UPS storage area and/or nearby rooms. Floor wax that contains silicon may cause static electricity.

WARNING	
	The UPS should be installed per local and/or national electric codes by qualified personnel. Faults or improper operation may occur if the UPS is not installed properly.
	When an external maintenance bypass is installed for the UPS, ensure that the phase shift across the external bypass matches the 30° Δ - Y phase shift that occurs across the UPS output isolation transformer. Failure to synchronize the maintenance bypass with the UPS output may damage to the UPS.
	When an external maintenance bypass is installed for the UPS, before switching to external bypass, ensure that the UPS unit is switched to AC Bypass mode and the UPS control panel display verifies the unit is Bypass mode. Switching to the external bypass while the unit is in UPS mode may damage the UPS.

TABLE 5.1 - UPS INSTALLATION ENVIRONMENT STANDARDS

Item	Environment standard	
Installation Location	Indoors	
Ambient Temperature	Minimum operating temperature: 32 °F (0 °C)	
	Maximum operating temperature: 104 °F (40 °C) (UPS only)	
	Maximum operating temperature: 95 °F (35 °C) (UPS with battery system)	
	Average 24-hour operating temperature: 41 - 95 °F (5 - 35 °C)	
Relative Humidity	The relative humidity must be between 30 and 90% and without condensation due to temperature changes.	
Altitude	These specifications are for altitudes up to 3240 ft. (1000m) above sea level. Consult with the factory to determine the derating factor for installations above 3240 ft. (1000m).	
Vibration and Mechanical Shock	Installation environment must not have vibration frequencies 10 Hz - 20 Hz	
	The acceleration due to vibrations less than 10 Hz must not exceed 0.5 G	
	The acceleration due to vibrations 20 Hz - 50 Hz must not exceed 0.5 G	
	The total amplitude due to vibrations 50 Hz - 100 Hz must not exceed 0.1 mm	
Dust	Dust must not exceed normal atmospheric levels and must not include conductive particles, silicone or oils.	
Flammable Gas	No flammable and/or explosive gas.	
	Hydrogen sulfide (H_2S)	Less than or equal to 0.0001 PPM
	Sulfurous acid gas (SO_2)	Less than or equal to 0.05 PPM
	Chlorine gas (Cl_2)	Less than or equal to 0.002 PPM
	Ammonia gas (NH_3)	Less than or equal to 0.1 PPM
	Nitrous acid gas (NO_2)	Less than or equal to 0.02 PPM
	Nitrous oxides (NOx)	Less than or equal to 0.02 PPM
	Ozone (O_3)	Less than or equal to 0.002 PPM
	Hydrochloric acid mist (HCl)	Less than or equal to 0.1 mg/m3

Installation Precautions

1) Install the unit in a stable, level and upright position that is free of excessive vibration.

2) Install the unit where the ambient temperature is within the specified range.

3) DO NOT install the UPS in areas that are subject to high humidity.

4) DO NOT install the UPS in areas that allow exposure to direct sunlight.

5) DO NOT install the UPS in areas that allow exposure to high levels of airborne dust, metal particles, or flammable gases.

6) DO NOT install the UPS in areas near sources of electrical noise. Ensuring a proper earth ground will reduce the effects of electrical noise and will reduce the potential for electrical shock.

7) The UPS generates and can radiate radio-frequency energy during operation. Although RFI noise filters are installed inside of the unit, there is no guarantee that the UPS will

not influence some sensitive devices that are operating near by. If such interference is experienced, the UPS should be installed further away from the affected equipment and/or powered from a different source than that of the installed equipment.

8) The user should provide over-current protection for hardwired UPS systems between the UPS output and the load input.

9) After ensuring that all power sources are turned “OFF” and isolated in accordance with established lockout/tagout procedures, connect the power source wiring of the correct voltage to the input terminals of the UPS.

NOTE: Ensure the input phasing is connected in clockwise rotation (CW). UPS internal circuitry is designed to disable further UPS operation if the input phasing is installed in counter-clockwise rotation (CCW).

10) Connect the output terminals of the UPS to the load (refer to NEC Article 300 - Wiring Methods and Article 310 - Conductors For General Wiring). Size the branch circuit conductors in accordance with NEC Table 310.16 as published 9/2007.

Conductor Routing and Grounding

1) Use separate metal conduits for routing the input power, output power, and control circuits.

2) Follow the wire size and tightening torque specifications.

3) Always ground the unit to reduce the potential for electrical shock and to help reduce electrical noise.

4) A separate ground cable should be run inside the conduit with the input power, output power, and control circuits.

5.1 Wiring/Connection

WARNING

Perform wiring and connections with correct polarity.

Be careful when connecting the UPS to the battery system. A wrong connection may cause damage to the UPS, battery, or charger.

Connect ONLY one (1) ground wire to the earth ground terminal.

A missing ground wire may cause an electrical shock hazard. Connecting to more than one ground may cause a ground loop.

See Chapter 11 - UPS Wiring

DO NOT force, bend, or pull wires.
DO NOT damage wire insulation.
DO NOT place heavy objects on top of UPS.

Observe the above precautions when making wire connections or handling the wires. Failing to observe these precautions may damage the insulation of the wires or may cause a fire or an electric shock hazard.

ATTENTION

Follow the torque criteria for tightening screws.

Loose connections may cause fire due to heating.

See Chapter 11 - UPS Wiring

6 Warning Labels

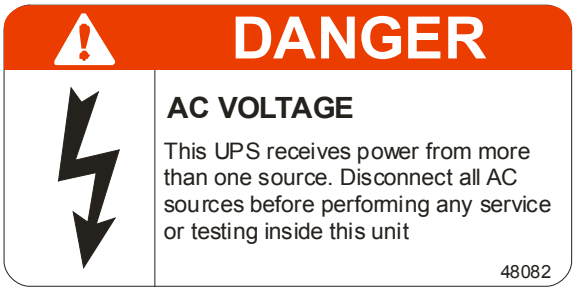
Below are representative warning labels and their location on the UPS. Exterior Handling labels shown in section 4.3, Transporting/Unpacking, are in the manual packet, and attached to the UPS shipping covering and shipping pallet.

ATTENTION

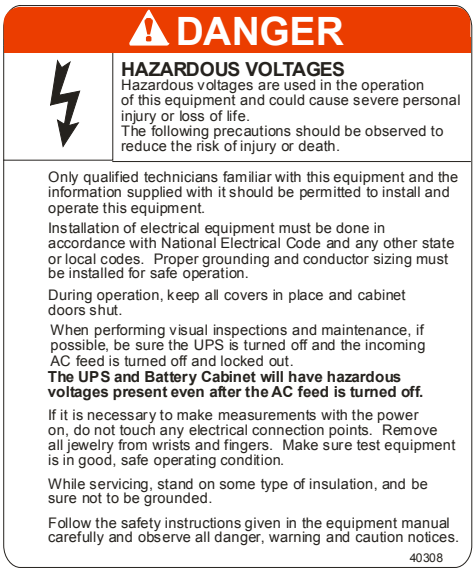
Make sure all the warning labels are installed in the appropriate locations.

If a label is missing or illegible, contact Toshiba Customer Support Center or an authorized representative.

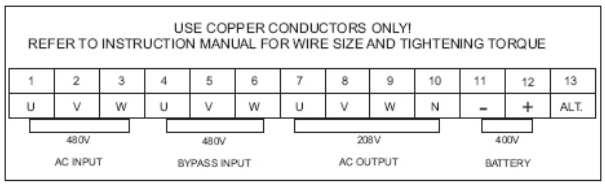
(A) – 48082


DANGER
AC VOLTAGE
This UPS receives power from more than one source. Disconnect all AC sources before performing any service or testing inside this unit
48082

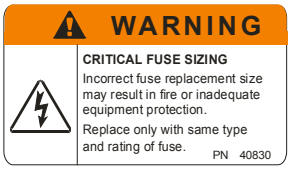
(B) – 40308


DANGER
HAZARDOUS VOLTAGES
Hazardous voltages are used in the operation of this equipment and could cause severe personal injury or loss of life.
The following precautions should be observed to reduce the risk of injury or death.
Only qualified technicians familiar with this equipment and the information supplied with it should be permitted to install and operate this equipment.
Installation of electrical equipment must be done in accordance with National Electrical Code and any other state or local codes. Proper grounding and conductor sizing must be installed for safe operation.
During operation, keep all covers in place and cabinet doors shut.
When performing visual inspections and maintenance, if possible, be sure the UPS is turned off and the incoming AC feed is turned off and locked out.
The UPS and Battery Cabinet will have hazardous voltages present even after the AC feed is turned off.
If it is necessary to make measurements with the power on, do not touch any electrical connection points. Remove all jewelry from wrists and fingers. Make sure test equipment is in good, safe operating condition.
While servicing, stand on some type of insulation, and be sure not to be grounded.
Follow the safety instructions given in the equipment manual carefully and observe all danger, warning and caution notices.
40308

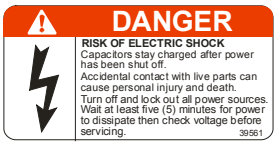
(C) – 59940 for 100 and 150 kVA


USE COPPER CONDUCTORS ONLY!
REFER TO INSTRUCTION MANUAL FOR WIRE SIZE AND TIGHTENING TORQUE
1 2 3 4 5 6 7 8 9 10 11 12 13
U V W U V W U V W N - + ALT.
480V
480V
208V
400V
AC INPUT
BYPASS INPUT
AC OUTPUT
BATTERY

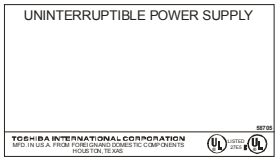
(D) – 40830


WARNING
CRITICAL FUSE SIZING
Incorrect fuse replacement size may result in fire or inadequate equipment protection.
Replace only with same type and rating of fuse.
PN 40830

(E) – 40830

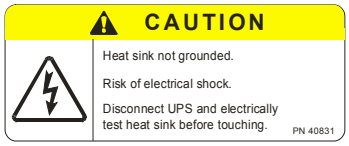

DANGER
RISK OF ELECTRIC SHOCK
Capacitors stay charged after power has been shut off.
Accidental contact with live parts can cause personal injury and death.
Turn off and lock out all power sources. Wait at least five (5) minutes for power to dissipate then check voltage before servicing.
39561

(F) – 40830


UNINTERRUPTIBLE POWER SUPPLY
TOSHIBA INTERNATIONAL CORPORATION
MFD. IN U.S.A. FROM FOREIGN AND DOMESTIC COMPONENTS
HOUSTON, TEXAS

(G) – 40830

(I) – 40830


CAUTION
Heat sink not grounded.
Risk of electrical shock.
Disconnect UPS and electrically test heat sink before touching.
PN 40831

(J) – 40830

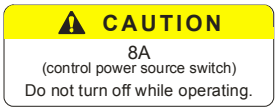


FIGURE 6.1 – G8000 WITH ISOLATED OUTPUT UPS WARNING LABELS

6.1 Warning Label Locations

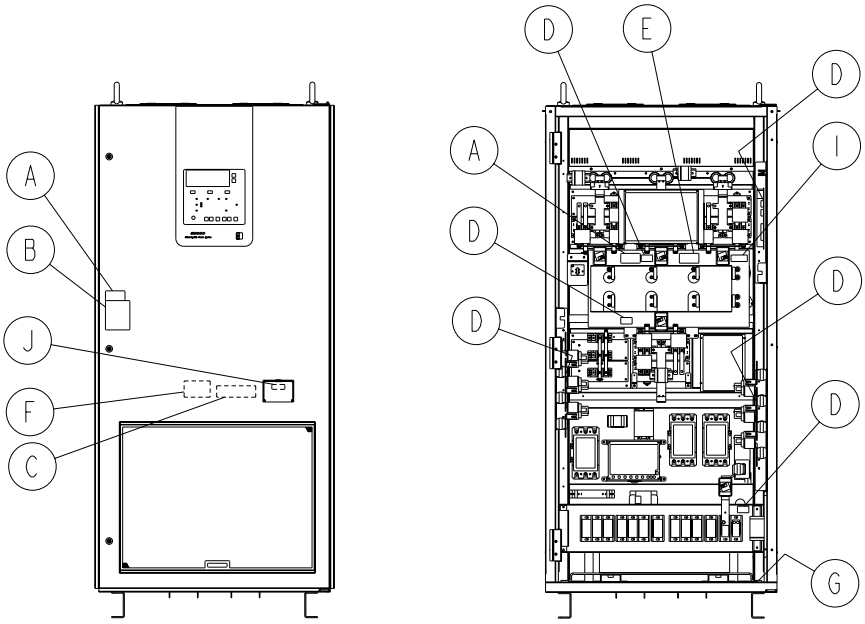


FIGURE 6.2 – 100 KVA UPS WARNING LABELS

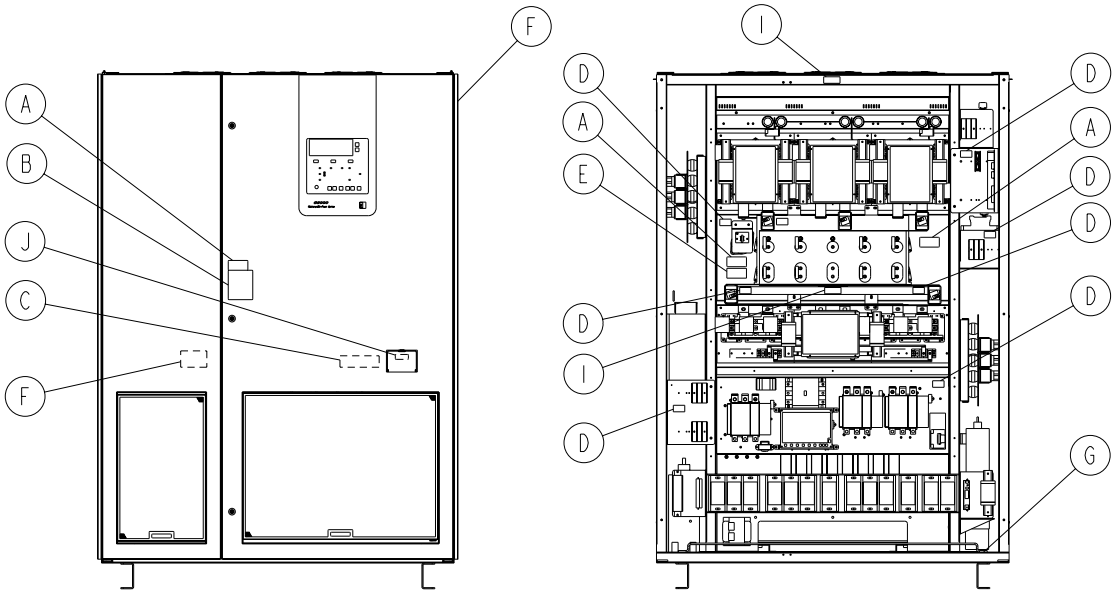


FIGURE 6.3 – 150KVA UPS WARNING LABELS

7 Weight and Dimensions

Table 7.1 lists the unit and shipping weight(s) for G8000 UPS models illustrated in Figures 7.1 – 7.2.

TABLE 7.1 G8000 UPS UNIT AND SHIPPING WEIGHT(S)

Model	Unit	Shipping
100 kVA	2206 lb (1000 kg)	2296 lb (1041.4 kg)
150 kVA	3200 lb (1451.5 kg)	3290 lb (1492 kg))

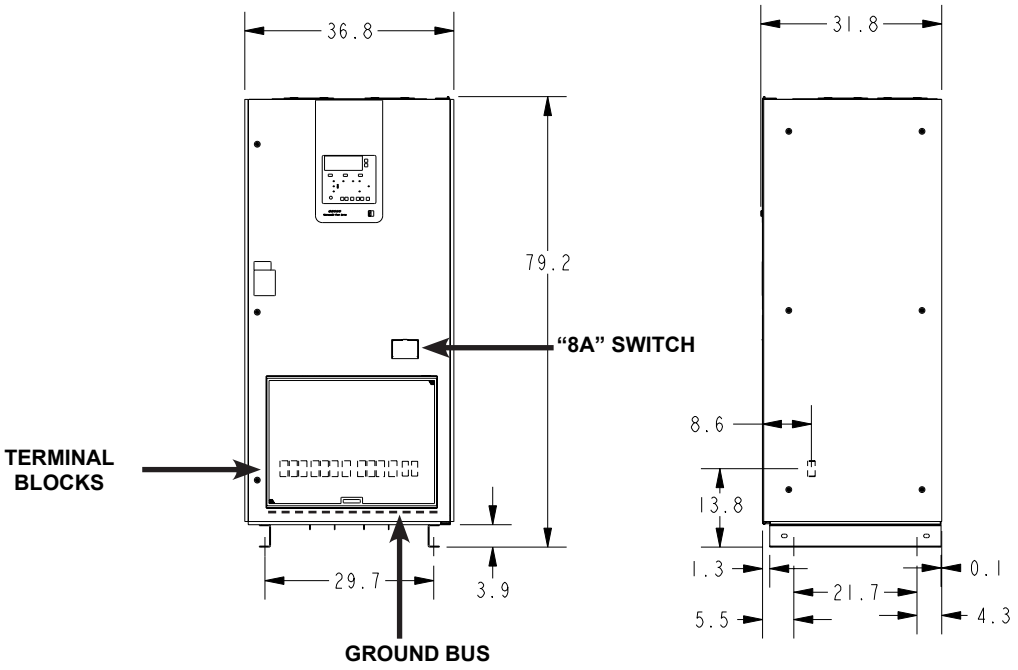


FIGURE 7.1 – 100 KVA UPS EXTERIOR DIMENSIONS (INCHES)

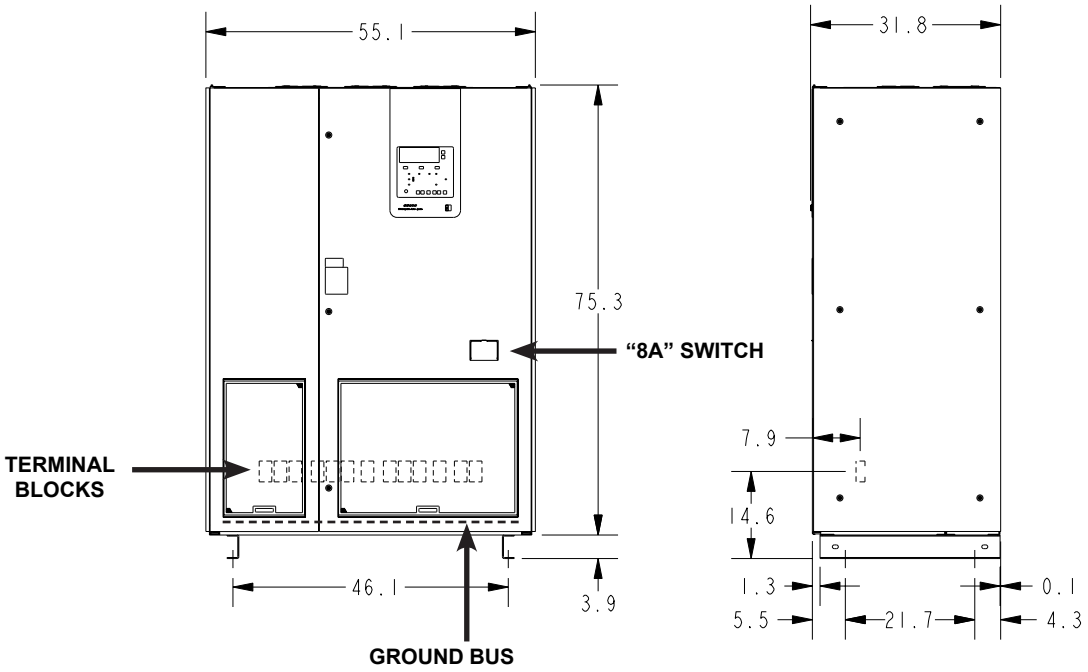


FIGURE 7.2 - 150KVA UPS EXTERIOR DIMENSIONS (INCHES)

8 Transporting

WARNING

When transporting the UPS by crane, follow the SPECIFIED WORK PROCEDURE. The suspension wire angle should be less than 60°.

The UPS falling or overturning may cause crushing, trapping or other personal injuries.

DO NOT tilt the UPS more than 10° from upright position.

Tilting the UPS more than 10° may cause crushing, trapping or other personal injuries.

CAUTION

DO NOT transport, move, store, or place the UPS on its side.

Excessive force applied from heavy components inside may damage the UPS.

Do NOT expose the unit to vibration or shock exceeding 0.5G.

Excessive vibration or shock may cause damage to the UPS.

DO NOT allow the UPS to suffer shock or impact when unpacking.

Tools used to remove packaging materials may cause damage to the UPS.

DO NOT install the UPS where water may fall on it.

Water may cause electrical shock, personal injury or UPS failure.

DO NOT push or pull on the sides of the packaging.or the UPS to move it. Always use a crane, forklift, or pallet jack for transporting and positioning the UPS.

Pushing/pulling on the sides of the unit to move it may result in damage to the UPS. (See Figure 4.1 Exterior Handling label.)

The UPS may be packed in a crate for extra protection during transportation. Avoid impact or vibration against the UPS during transportation. DO NOT expose the UPS directly to water.

8.1 Transporting By Crane

Cables should have sufficient ratings and be of the same length. Make sure the suspension cables are hooked at eyebolts. See Figure 8.1. Keep the angle less than 60° between cables.

Refer to Chapter 7 - Weight and Dimension for UPS cabinet weight.

Keep UPS leveled when lifting. DO NOT swing or tilt the UPS. Minimize the impact when lowering the UPS to the floor. Figure 8.2 and 8.3 indicate unacceptable lifting.

Figure 8.4 and 8.5 show examples of acceptable and unacceptable operations.

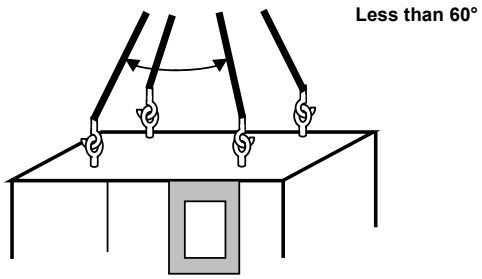


FIGURE 8.1 - CABLES AND EYEBOLTS TO LIFT THE UPS

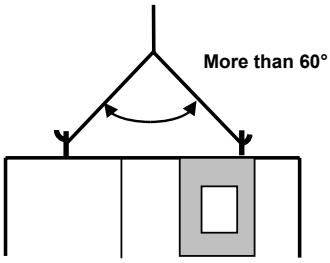


FIGURE 8.2 - ANGLE MORE THAN 60°

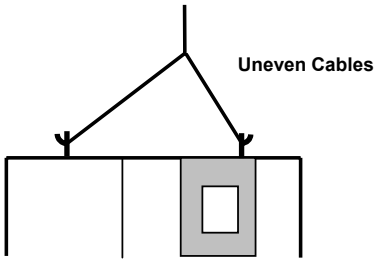


FIGURE 8.3 - UNEVEN CABLES

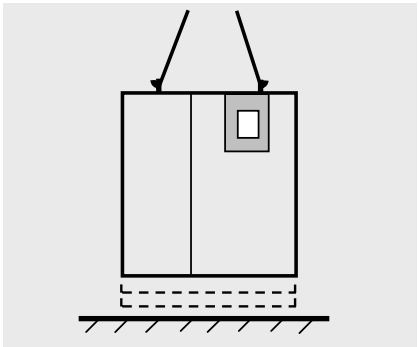


FIGURE 8.4 - ACCEPTABLE OPERATION

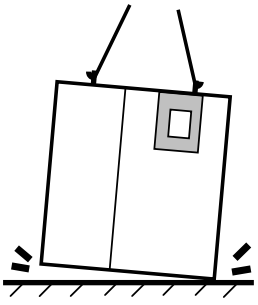


FIGURE 8.5 - UNACCEPTABLE OPERATION

8.2 Transporting By Forklift

Refer to Chapter 7 - Weight and Dimensions.

Verify forklift maximum load capacity and ensure that the forks are long enough to properly support the UPS. Insert the forks into the space shown in Figure 8.6. Spaces for the forks are provided underneath the UPS.

DO NOT swing or tilt UPS when lifting and/or transporting. Minimize the impact when lowering the UPS to the floor.

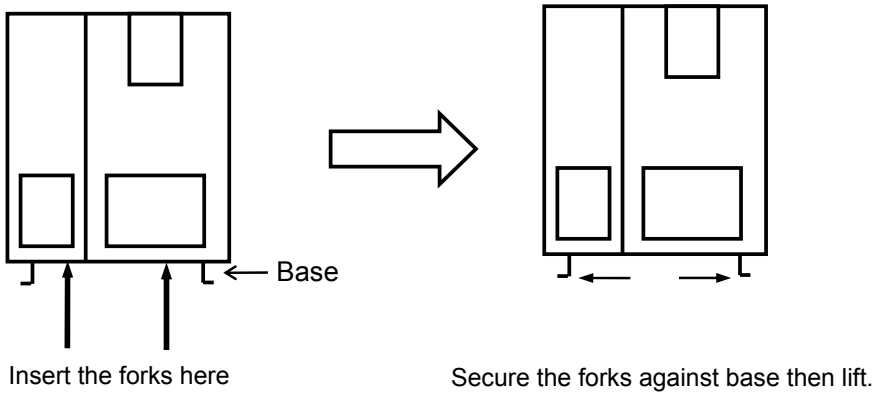


FIGURE 8.6 -TRANSPORTING UPS BY FORKLIFT

9 Storage/Operating Environment

Observe the following when storing the UPS.

- Store UPS indoors.
- Maximum storage time for the UPS between powered operation cycles is three years. If the UPS has been stored for a period exceeding 36 months, contact your factory authorized represnetative of guidance in starting the unit.
- Temperature fluctuations should be minimized.
- The optimal storage temperature range is 68 – 77 °F (20 – 25 °C).
- A maximum temperature range of 32 – 95 °F (0 – 35 °C) should be observed.
- The optimal relative humidity at the storage location should be between 50 – 60%.
- Humidity must not exceed 90%.
- Avoid locations where UPS may be exposed to corrosive gas.
- Avoid locations with dirt and/or dust.

TABLE 9.1 - UPS STORAGE/OPERATING ENVIRONMENT STANDARDS

Item	Environment standard	
Storage Location	Indoors	
Ambient Temperature	Minimum storage temperature: 32 °F (0 °C)	
	Maximum storage temperature: 104 °F (40 °C)	
Relative Humidity	The relative humidity must be between 30 and 90% and without condensation due to temperature changes.	
Altitude	This equipment is rated for installations up to 3240 ft. (1000m) above sea level. Consult with the factory to determine the derating factor for installations above 3240 ft. (1000m).	
Dust	Dust must not exceed normal atmospheric levels and must not include conductive particles, silicone or oils.	
Flammable Gas	No flammable and/or explosive gas.	
	Hydrogen sulfide (H_2S)	Less than or equal to 0.0001 PPM
	Sulfurous acid gas (SO_2)	Less than or equal to 0.05 PPM
	Chlorine gas (Cl_2)	Less than or equal to 0.002 PPM
	Ammonia gas (NH_3)	Less than or equal to 0.1 PPM
	Nitrous acid gas (NO_2)	Less than or equal to 0.02 PPM
	Nitrous oxides (NOx)	Less than or equal to 0.02 PPM
	Ozone (O_3)	Less than or equal to 0.002 PPM
	Hydrochloric acid mist (HCl)	Less than or equal to 0.1 mg/m^3

9.1 Operating Precautions

Initial startup/comisioning of the UPS should be performed by factory authorized personnel.

1) The UPS should not be powered up until the entire operation manual has been read.
2) The voltage of the input power source must be within the rated input voltage range. The input frequency range must be within the rated input frequency range.

3) The UPS should not be used with a load that has a rated input that is greater than the rated output of the UPS.

4) If using the UPS to provide power to motors that require high starting current or with motors that require a long starting time, call Toshiba support for guidance in over sizing the UPS for lock rotor current.

5) DO NOT insert metal objects or combustible materials in the ventilation slots of the UPS.

6) DO NOT place, hang, or paste any objects on the exterior surfaces of the UPS.

7) The capacitors of the UPS maintain a residual charge for a while after turning off the UPS. The required discharge time for each UPS is provided via a cabinet label. Wait for at least the minimum time indicated on the label and ensure that the front panel LED's have gone out before removing the front panel of the UPS once the UPS power has been turned off.

8) DO NOT attempt to disassemble, modify, or repair the UPS. Call your Toshiba sales representative for repair information.

9) Turn the power on only after installing **ALL** of the covers.

10) DO NOT remove any covers of the UPS when power is on.

11) If the UPS should emit smoke or an unusual odor or sound, turn all power sources off immediately.

12) Warning signs should be placed on or near the load as a notification that the load is being powered by the UPS.

13) Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.

WARNING

While operating in the inverter mode, placing the input breaker in the "OFF" position will switch the UPS to the battery backup mode.

The output of the UPS will continue uninterrupted to the load. The unit must be in the bypass mode at the time that the breaker is placed in the "OFF" position for the UPS to shutdown power to the load.

CAUTION

After an Emergency Power Off (EPO), DO NOT reset the breaker until the UPS internal circuits have been fully discharged.

The UPS could be damaged if the unit is not fully discharged before the breaker is reset.

9.2 Maintenance Precautions

All internal maintenance sould be performed by factory authorized personnel.

1) Turn off, lockout, and tagout ALL power sources before connecting the power wiring to the equipment or when performing maintenance.
2) Hardwire type UPS units are not equipped with an over-current protection device, nor do they have an output disconnect for the AC output. A user-installed circuit breaker should be provided between the UPS output and the load input.
3) The maximum ambient operating temperature is 104 °F (40 °C).
4) Only factory authorized personnel should service the UPS. Contact Toshiba for the the nearest authorized service center.
5) Battery servicing should be performed by factory authorized personnel only. Contact your nearest factory authorized service center for battery replacement.

Qualified Personnel ONLY!

Qualified Personnel have the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

Qualified Personnel shall:

1) Have read the entire operation manual.
2) Be trained and authorized to safely energize, de-energize, ground, lockout and tag circuits and equipment, and clear faults in accordance with established safety practices.
3) Be trained in the proper use and care of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
4) Be trained in rendering first aid.
5) Be knowledgeable of batteries and the required handling and maintenance precautions.

WARNING

Misuse of equipment could result in injury and equipment damage.

In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may result from the misuse of this equipment.

CAUTION	
	DO NOT dispose of the batteries in a fire. The batteries may explode.
	DO NOT open or mutilate the batteries. Released electrolyte is harmful to the eyes and skin and could also be toxic.

DANGER	
	A battery can present a risk of electrical shock and high short circuit current.

9.3 Disposal

Please contact your local or state environmental agency for details on disposal of electrical components and packaging in your particular area.

It is illegal to dump lead-acid batteries in landfills or dispose of them improperly.

Please help protect the Earth by contacting the environmental protection agencies in your area, the battery manufacturer, or call Toshiba toll-free at (877) 867-8773 for more information about recycling batteries.

10 Installation

WARNING	
	Keep the SPECIFIED CLEARANCE around the UPS. Inadequate space around the UPS makes it difficult to perform maintenance/inspections, lead to insufficient ventilation, and/or will cause malfunctions. *See Figure 10.1 - UPS Clearance*
	DO NOT tilt the UPS more than 10° from upright position. Tilting the UPS more than 10° may cause crushing, trapping or other personal injuries.
	Install anchor bolts to secure the UPS to the installation floor.
	DO NOT transport, move, store, or place the UPS on its side. Forces due to heavy components inside may damage the UPS.
	DO NOT allow the UPS to suffer shock or impact when unpacking. Tools used to remove packaging materials may cause damage to the UPS.
	DO NOT push or pull on the sides of the packaging.or the UPS to move it. Always use a crane, forklift, or pallet jack for transporting and positioning the UPS. Pushing/pulling on the sides of the unit to move it may result in damage to the UPS. See Figure 4.1 Exterior Handling label.

10.1 Unpacking

Unpack the UPS indoors on a paved floor. The UPS should be as close as possible to its final storage location. Overhead traveling cranes should be used to unpack any G8000 Series UPS. If an overhead traveling crane is not available, allow enough space for forklift operations to unpack the UPS crate. Then remove the crate.

Points to observe

- Retain all small articles during unpacking and installation.
- Make sure that exterior paint is not scratched and that the UPS cabinet is not damaged.
- DO NOT damage the UPS when using tools to remove packaging materials.
- If provided, DO NOT remove the plastic sheet cover, until installation.
- Do not remove the fan covers until UPS start up. The fan covers should be removed by factory authorized personnel.
- Packing materials should be disposed by the appropriate means.
- Immediately report any abnormalities to Toshiba Customer Support Center or an authorized representative.

10.2 UPS Clearance

Maintain the indicated clearance during installation. See Figure 10.1. Ensure that the front and top air vents are NOT blocked.

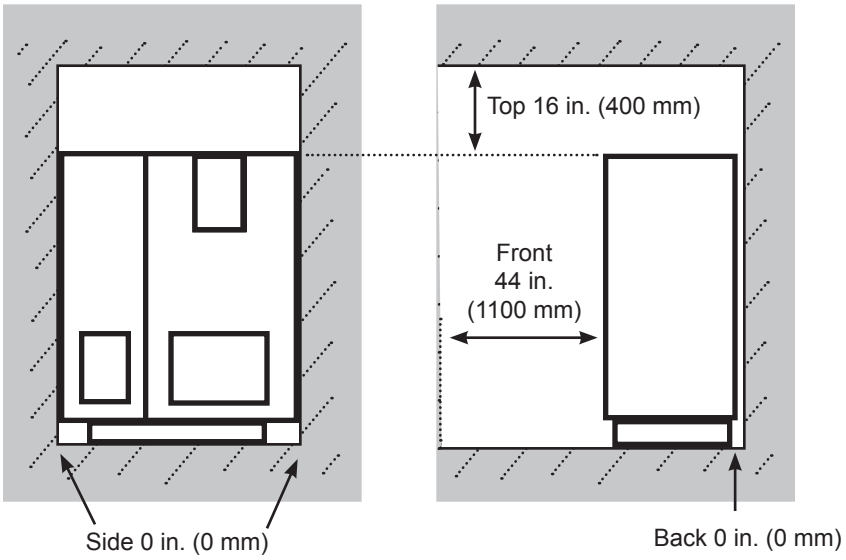


FIGURE 10.1 - UPS CLEARANCE

10.3 Anchor Bolts

Install the anchor bolts to secure the UPS on the floor. See Figure 10.2 for anchor bolt installation detail. Use 12mm (1/2”) diameter anchor bolts. There are 16mm (5/8”) diameter holes provided in the UPS base. See Figure 10.3 for the hole locations and dimensions for the specified UPS models.

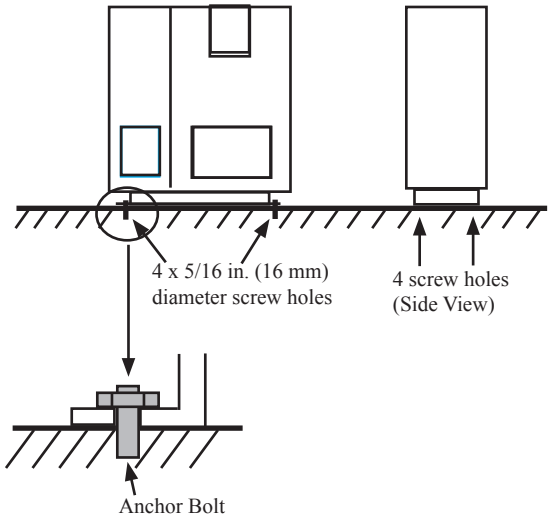


FIGURE 10.2
ANCHOR BOLT INSTALLATION DETAIL

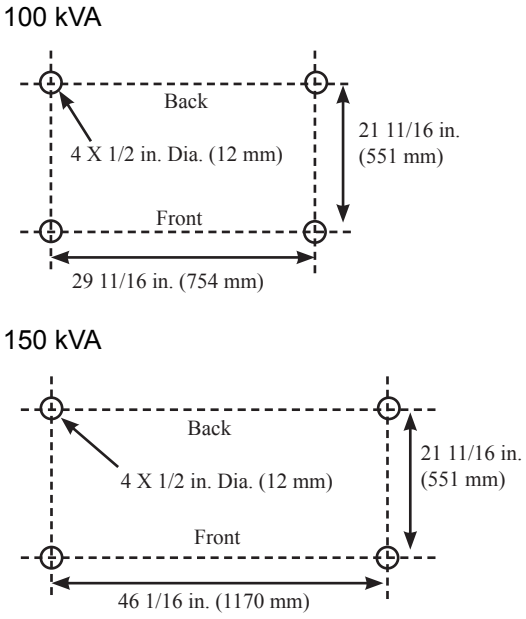


FIGURE 10.3
HOLE LOCATIONS/DIMENSIONS
ON BOTTOM OF UPS

11 UPS Wiring

Note: Always consult your local and NEC electrical codes for wiring, cabling, and circuit protection devices. requirements.

Figure 11.1 illustrates the external wiring of the G8000 UPS. See corresponding section to each wiring term.

- Power cable connection at terminal blocks/buses and external breaker provision for the AC input/output, Bypass Input and DC input.
- Earth ground wire at grounding terminal.
- Control wire terminal TB1 (battery cabinet and bypass breaker)

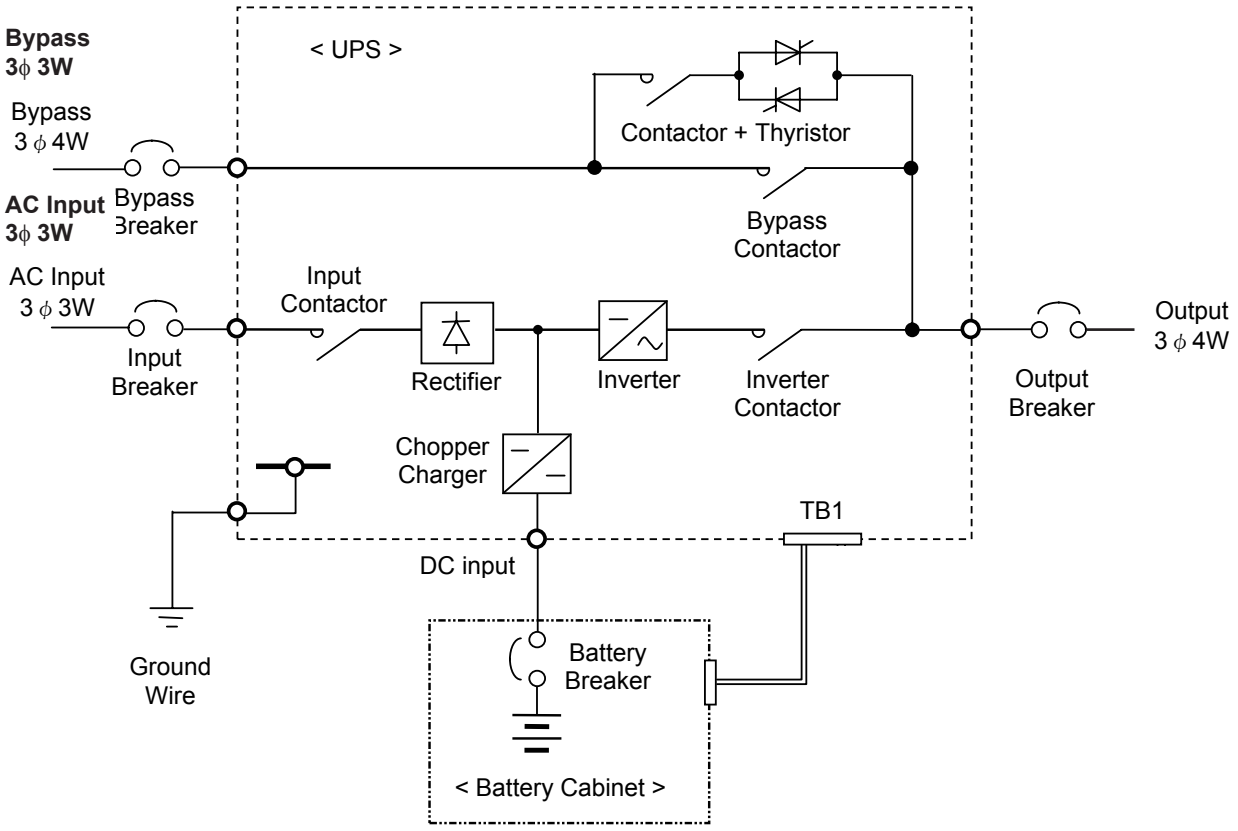


FIGURE 11.1 - EXTERNAL WIRING DIAGRAM

An external maintenance bypass may be installed in parallel with the UPS to allow servicing of the G8000 while maintaining power to the UPS load. Contact the Toshiba Customer Service for further information.

11.1 Terminal Blocks, Terminal Bus, and Power Cables

Note: Always consult your site specific, local, state, and NEC electrical codes for wiring, cabling, and circuit protection device requirements.

The terminal blocks for the 100/150 kVA UPS are shown in Figure 11.2. The terminal blocks are located inside, at the bottom of the UPS.

External cable size, lug, and tightening torque recommendations are listed in Table 11.1 – 11.2.

Use only copper wires for external cables.

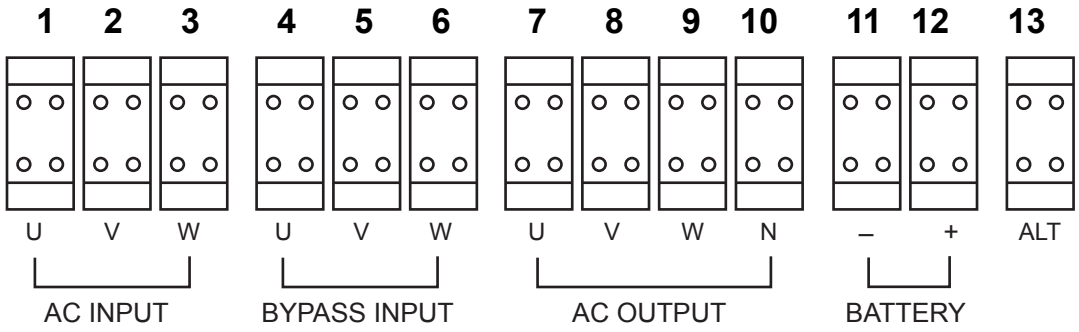


FIGURE 11.2 - TERMINAL BUS FOR 100/150 KVA UPS UNITS

Some 100/150 kVA units are equiped with termnal bus strips in place of terminal blocks. Terminal bus detais are shown in Figure 11.3.

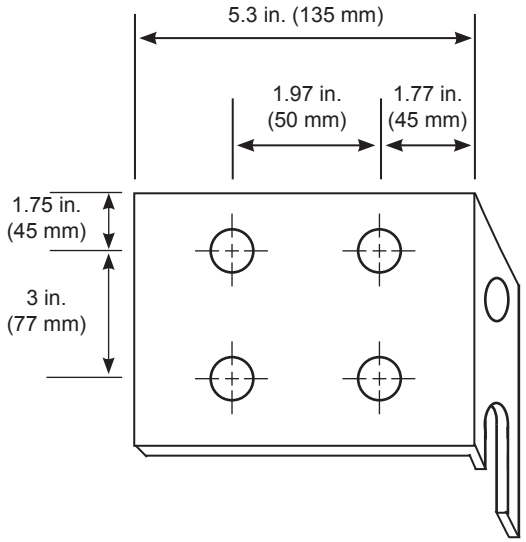


FIGURE 11.3 - TERMINAL BUS DETAIL

TABLE 11.1 RECOMMENDED CRIMP TYPE COMPRESSION LUGS

Wire Size	Wire Strand Class	Recommendation		Crimp tool Required Burndy type Y35 or Y46	
		Vendor	Cat. No.	Color Key	Die Index
1/0	B I B	Burndy Ilsco Burndy	YA25 CRA-1/OL YA25-LB	Pink Pink Black	12 / 348 12 / 348 13
2/0	B I B	Burndy Ilsco Burndy	YA26 CRA-2/OL YA27-LB	Black Black Orange	13 13 14 / 101
3/0	B I B	Burndy Ilsco Burndy	YA-27 CRB-3/OL YA28-LB	Orange Orange Purple	14 / 101 14 / 101 15
4/0	B I B	Burndy Ilsco Burndy	YA28 CRB-4/OL YA29-LB	Purple Purple Yellow	15 15 16
300 MCM	B I B	Burndy Ilsco Burndy	YA30 CRA-30OL YA32-LB	White White Red	17 / 298 17 / 298 18 / 324

TABLE 11.2 RECOMMENDED CABLE SIZE AND TIGHTENING TORQUE FOR 100 KVA AND 150 KVA UPS

Block Number	Cable Size		Tightening Torque
	100 KVA	150 KVA	
1	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
2	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
3	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
4	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
5	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
6	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
7	Two AWG 2/0 or larger	Two AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
8	Two AWG 2/0 or larger	Two AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
9	Two AWG 2/0 or larger	Two AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
10	Two AWG 2/0 or larger	Two AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)
*11	Two AWG 3/0 or larger	Two 300 MCM or larger	275 in-lbs. (3.2 kg-m)
*12	Two AWG 3/0 or larger	Two 300 MCM or larger	275 in-lbs. (3.2 kg-m)
13	AWG 2/0 or larger	AWG 4/0 or larger	275 in-lbs. (3.2 kg-m)

NOTE: MAXIMUM CABLE SIZE IS 350 MCM

***ONE BATTERY STRING (SEE NOTE, PAGE 36, IF USING MULTIPLE BATTERY STRINGS**

Cable knockout plates are provided at the bottom of the 100 kVA UPS, and at the bottom and top of the 150 kVA UPS. The recommended hole locations are illustrated in Figure 11.4 - 11.6

The five (5) holes must be punched during installation. The dashed rectangle indicates the UPS opening behind the knockout plates.

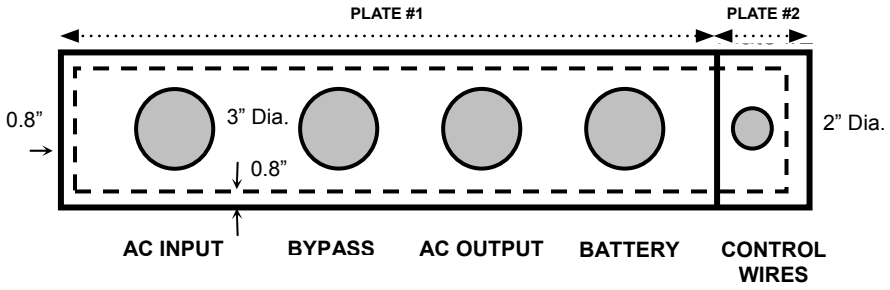


FIGURE 11.4 - BOTTOM CABLE KNOCKOUT PLATES - 100 KVA)

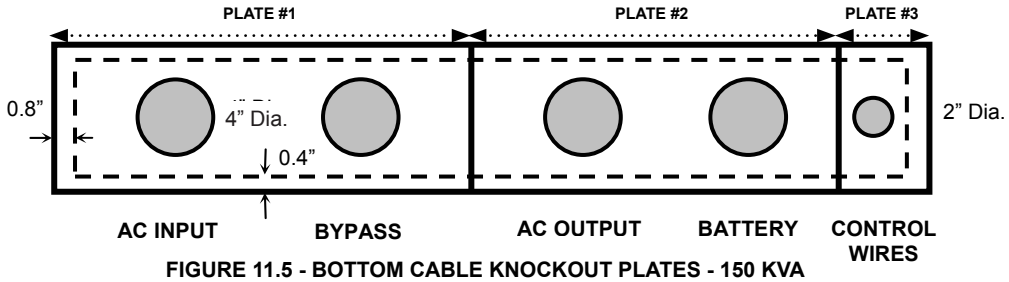


FIGURE 11.5 - BOTTOM CABLE KNOCKOUT PLATES - 150 KVA

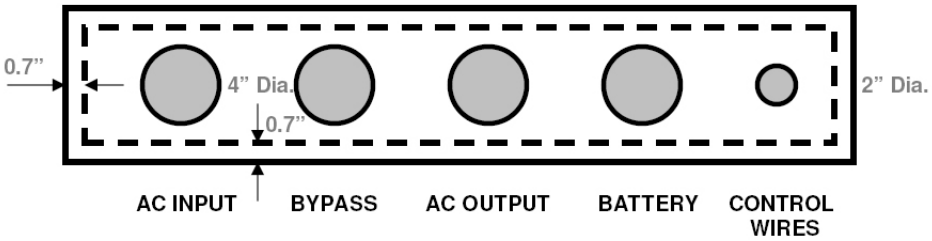


FIGURE 11.6 - TOP CABLE KNOCKOUT PLATE - 150 KVA

11.2 External Breakers

The G8000 UPS units are not equipped with circuit breakers. Qualified personnel should provide the external breakers for the AC input/output, bypass input and DC input.

See Figure 11.1 – External Wiring Diagram, for the circuit position of the breakers.

Table 11.3 shows the G8000 UPS minimum external breaker rating for each capacity. The bypass input and the AC output require 3-pole breakers.

TABLE 11.3 EXTERNAL BREAKER RATING

Capacity	AC Input / Bypass Input / AC Output Minimum Breaker Rating	DC Input Minimum Breaker Rating
100 kVA	480V - 200A / 480V - 200A / 208V - 350A	500 VDC – 400 A
150 kVA	480V - 250A / 480V - 250A / 208V - 600A	500 VDC – 600 A

11.3 Grounding Wire

WARNING

Be sure to ground the UPS as specified.

Using the UPS without a proper ground will deteriorate the insulation, cause leakage of currents and electric shock.The resistance to ground should be less than or equal to 10 ohms.

The 100/150 kVA earth grounding bus is located inside, at the bottom-front of the unit. The 150 kVA earth grounding buss is accessable through either the bottom or top knockout panel.

Use a 2 AWG (or 38 mm^2) or larger cable for the grounding wire. Run the grounding wire through the opening at the bottom, or alternately through the top if a 150 kVA unit.

The ground wire must have a crimp terminal with a 1/2” (12 mm) diameter bolt hole. The ground bus has a 33/64” (13 mm) bolt hole. The crimp terminal and ground bus should be connected together using a 7/16” (10 mm) diameter bolt.

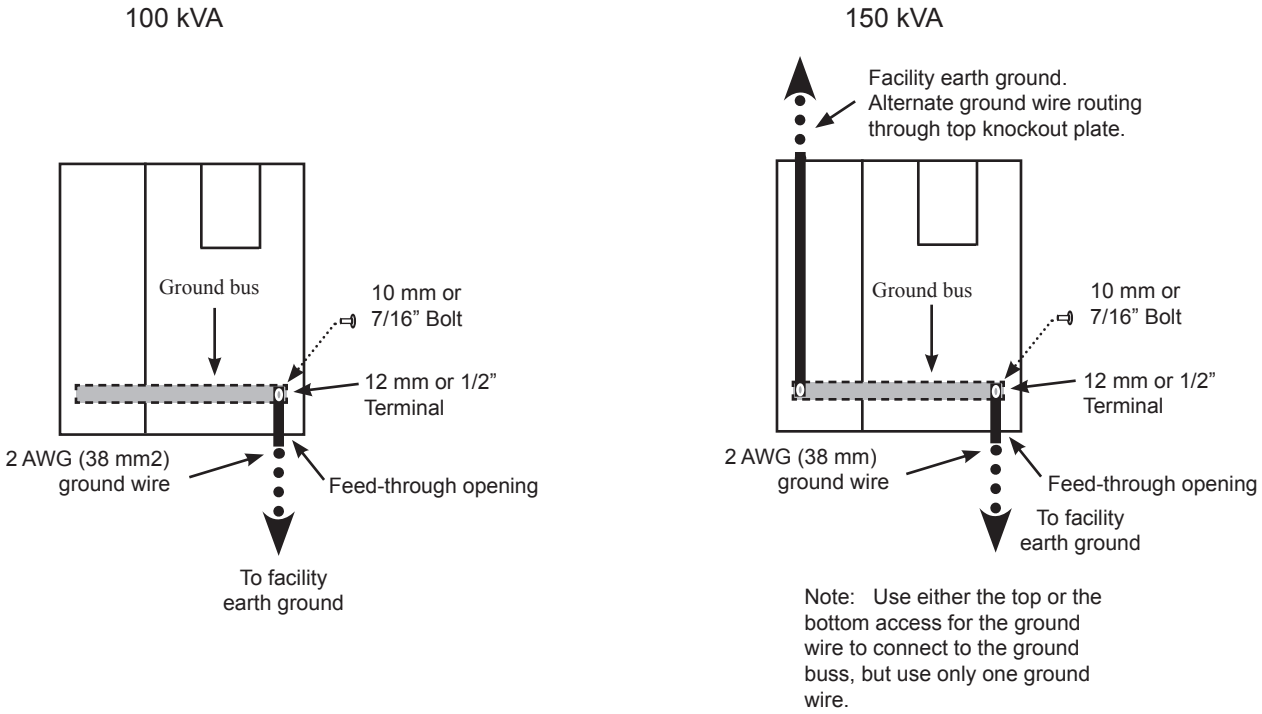


FIGURE 11.7 - EARTH GROUND WIRE

11.4 Control Wires

The control wires terminal layouts at TB1 (terminal bus 1) are shown below in Table 11.4.

TABLE 11.4 EXTERNAL CONNECTIONS

No.	I/O	Signal Name	Operation
1	Output	Low Battery	Closed at Low Battery
2	Output	Backup Operation	Closed during Backup Operation
3	Output	Fault	Closed if Faults present
4	Output	Inverter Supply	Closed during Normal Operation
5	Output	Warning	Closed if Warnings present
6	Input	P24	
7	Input	Remote Run	Close to run UPS
8	Input	P24	
9	Input	Remote Stop	Close to stop UPS
10	Output	Bypass Supply	Close during Bypass Operation
11	Output	Output Signal Ground	(Ground for pin #1 – 5 & #10)
12	Input	P24	Battery's
13	Input	Battery Overheat	Overheat B-contact
14	Output		Bypass Breaker
15	Output	52C Trip Signal	Shunt Trip Signal by EPO
16	Output		Battery Breaker shunt trip
17	Output	72B Trip Signal	by EPO or Battery shutdown
18	Output		Battery breaker's
19	Output	72B Aux. Contact	Auxiliary A-contact
20			
21	Output	External EPO	Ext EPO (Customer) N.O. Contacts
22	Output	External EPO	Ext EPO (Customer) N.O. Contacts

Note: All control wiring should be #18 AWG (0.823 mm^2) or larger.

The UPS battery cabinet and bypass breaker should be wired as shown below in Figure 11.8.

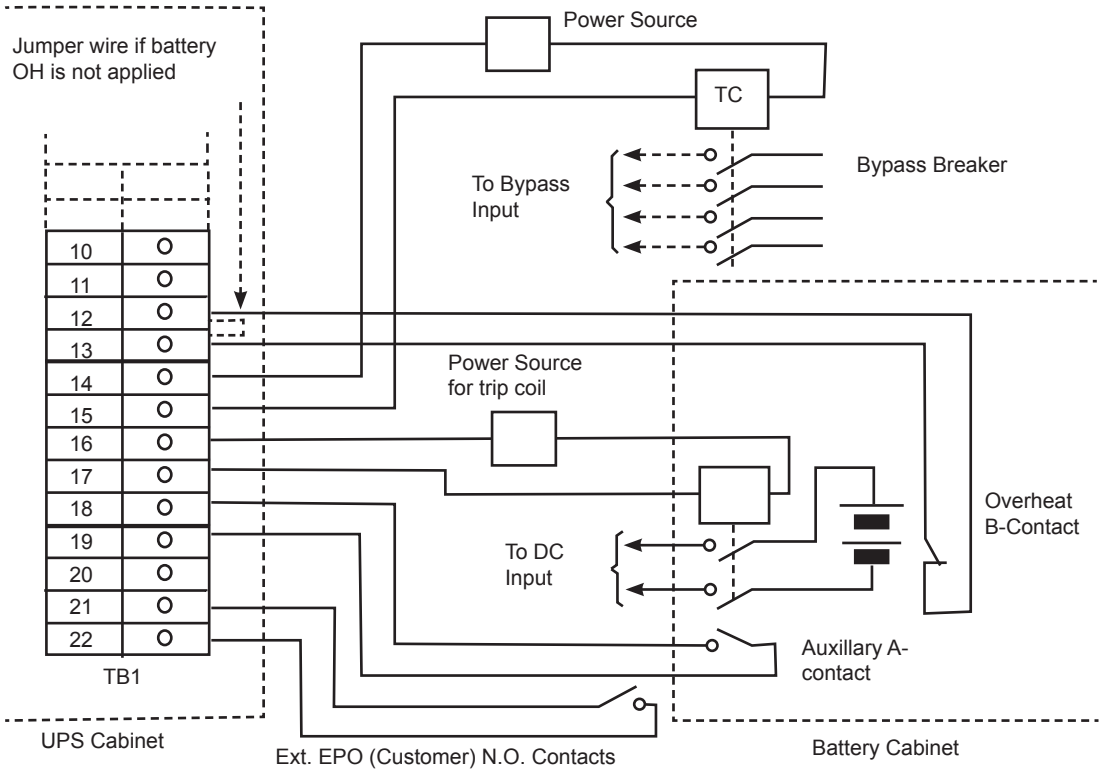


FIGURE 11.8 - CONNECTION BETWEEN UPS, BATTERY CABINET & BYPASS BREAKER

11.5 Grounding Configuration

This section describes the grounding configuration to be used with this UPS.

A 2 AWG (or 38 mm^2) factory-installeded jumper cable is provided between the neutral terminal and ground bus in the UPS cabinet. The jumper cable location is illustrated below.

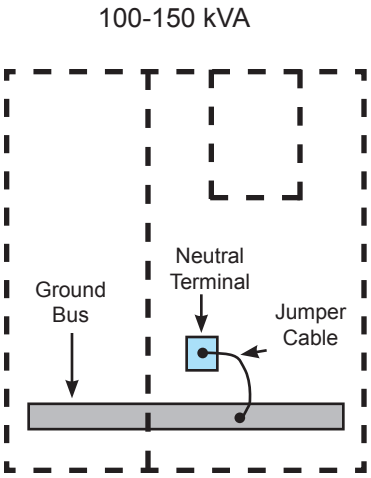


FIGURE 11.9 - JUMPER CABLE BETWEEN THE NEUTRAL TERMINAL & GROUND BUS

Since the input source is a delta-connection (3-phase 3-wire) without ground, the neutral terminal in the UPS cabinet must be connected to the ground bus with the internal jumper cable as shown in Figure 11.9.

The jumper cable should stay in place. See Figure 11.9 for the jumper cable location.

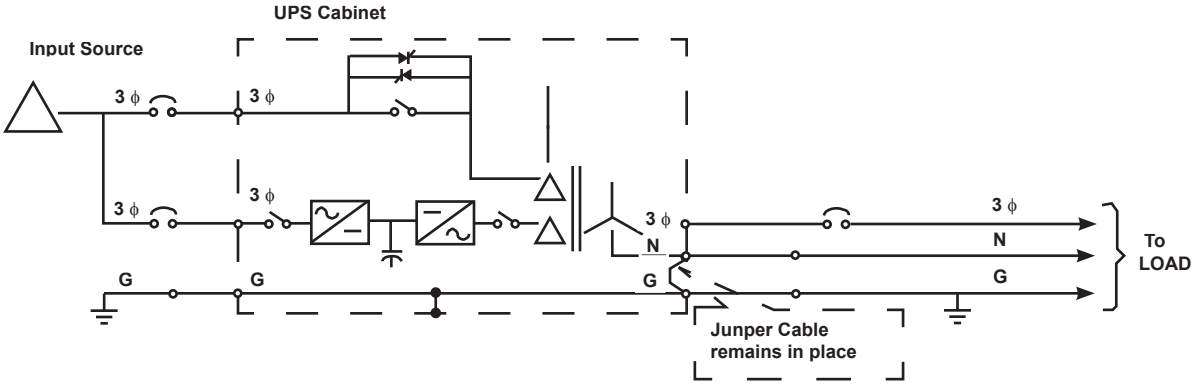


FIGURE 11.10 - GROUNDING CONFIGURATION FOR NON-GROUNDED DELTA-INPUT

12 UPS Specifications

12.1 General Specification

Terms	Specification	Remarks
Conforming Standard	UL1778-2001	UL, cUL, IEC
Ambient Temperature	32 – 104 °F (0 – 40 °C)	
Relative Humidity	30% – 90%	Non-condensing
Altitude	< 3,280 ft (< 1,000 m)	Contact Toshiba Technical Support for instalation above 3280 ft. (1000 m)
Audible Noise	68dB(150 kVA)	1m (39”) away from front
Insulation Resistance	3 MΩ	With 500 V-Megger
Insulation Breakdown	AC 2 kV – 1 min.	Main Circuit
	AC 1.5 kV – 1 min.	External Interface
	AC 500 V – 1 min.	Control Circuit

12.2 Mechanical Specification

Rated Capacity	100kVA
Cabinet Protection Conformity	IEC298 IP20*
Exterior Paint	Sherwin Williams, HHT2-7055, 079 Beige Texture
Panel Thickness	FRONT: 1/16 in. (1.6mm) BACK/SIDE/TOP: 3/64 in. (1.2mm) BOTTOM: 1/8 in. (3.2mm)
Input/Output Cabling Entrance	BOTTOM
Ground/Control Wiring Entrance	BOTTOM
Outline Dimension	W: 36.8 in. (935 mm) D: 31.8 in. (808 mm) H: 79.2 in. (2,012 mm)
Unit Weight	2006 lb (1000 kg))
Shipping Weight	2096 lb (1041.4 kg)
Floor Loading Per Footprint	2446 lbs/ft^2 (13,126 kg/m^2)
Clearance	FRONT: 43 7/16 in. (1,100 mm) BACK/SIDE: 0 in. (0 mm) TOP: 15 3/4 in. (400 mm)
Heat Rejection	27,620 BTU/h (6,960 kcal/h)

*IP20: Foreign objects that are 12mm (15/32”) or larger are prevented from entering the enclosure of the UPS.

12.2 Mechanical Specification (cont.)

Rated Capacity	150kVA
Cabinet Protection Conformity	IEC298 IP20*
Exterior Paint	Sherwin Williams, HHT2-7055, 079 Beige Texture
Panel Thickness	FRONT: 1/16 in. (1.6 mm) BACK/SIDE/TOP: 3/64 in. (1.2 mm) BOTTOM: 1/8 in. (3.2 mm)
Input/Output Cabling Entrance	TOP and BOTTOM
Ground/Control Wiring Entrance	TOP and BOTTOM
Clearance	
Outline Dimension	W: 55.1 in. (1400 mm) D: 31.8 in. (808 mm) H: 79.2 in. (2012 mm)
Unit Weight	3200 lb (1451.5 kg)
Shipping Weight	3290 lb (1492 kg))
Floor Loading Per Footprint	3902.4 lbs/ft^2 (19,053 kg/m^2)
Clearance	FRONT: 43 7/16 in. (1,100 mm) BACK/SIDE: 0 in. (0 mm) TOP: 15 3/4 in. (400 mm)
Heat Rejection	35,635 BTU/h (8,980 kcal/h)

*IP20: Foreign objects that are 15/32 in. (12 mm) or larger are prevented from entering the enclosure of the UPS.

12.3 Electrical Specification

WARNING

DO NOT open the front cover.

Electric shock, burns or other personal injuries may occur if unqualified personnel open the front cover.

AC Input Rated Capacity	100 kVA (80 kW)	150 kVA (120 kW)
Input Voltage	480 V (+10% – -15%), 3-Phase 3-Wire	
Input Frequency	60 Hz ±5%	
Input Power Factor	1.00 – 0.95 Lagging (at 100% Load)	
Current Harmonic Distortion	5% Maximum (at 100% Load)	
Input Capacity Required	107 kVA	154 kVA
Circuit Breaker Rating At 480 V Input	200 A	250 A

DC Input Rated Capacity	100 kVA (80 kW)	150 kVA (120 kW)
Voltage Window	288 – 414 V	
Recharge Voltage Regulation	± 1.5%	

AC Output Rated Capacity	100 kVA (80 kW)	150 kVA (120 kW)
Output Voltage	208/120 V ± 1%, 3-Phase 4-Wire	
Output Power Factor	0.8 Lagging	
Voltage Distortion	3% with 100% Linear Load / 5% with Non-Linear Load	
Transient Voltage Regulation	< ± 2%	
Transient Settling Time	< 50 msec	
Crest Factor	< 2.0	
Output Frequency	60 Hz ± 0.01% (at Free-running Mode)	
Synchronous Window To Utility Line	59 Hz – 61 Hz	
Frequency Slew Rate	1 Hz/Sec	
Over Load Rating	100%-Continuous / 125%-10min. / 150%-1min.	

13 Operator Interface

Table 13.1 shows the functions of the operating buttons on the graphic display panel.

ATTENTION

Press an operating button for at least 0.5 seconds to change UPS modes. Press the reset button for for at least 5 seconds to reset the UPS.

The UPS may not respond if the button press is too short.

TABLE 13.1 BUTTON AND INDICATOR FUNCTIONS (See fig. 13.1 and 13.2)

#	Name	Function
1	OPERATION LOCK	Enables/disables the buttons RUN, STOP, UPS, BYPASS, FLOAT/EQUAL, and RESET.
2	STOP BUTTON	Stops the UPS. Transfers to bypass power if avialable.
3	RUN BUTTON	Starts the UPS. Transfers the unit from bypass to UPS power.
4	FLOAT/EQUAL BUTTON	Changes recharge mode between float charge and equalize charge.
5	SCROLL UP BUTTON	Scrolls the LCD screens up.
6	SCROLL DOWN BUTTON	Scrolls the LCD screens down.
7	RESET BUTTON	Reset UPS faults and warnings shown on the LCD. (See Section 13.5)
8	UPS BUTTON	Transfers from bypass operation to normal operation.
9	BYPASS BUTTON	Transfers from normal operation to bypass operation.
10	EPO BUTTON	“ON” during Bypass Supply.
11	LCD DISPLAY	Displays the operational, status, and warning/fault messsages.
12	UPS SUPPLY LED	“FLASHES” during START or STOP sequence “ON” when operating in inverter mode.
13	CONVERTER LED	“ON” after DC bus capacitors are fully charged through the converter.
14	AC INPUT LED	“ON” with nominal AC input. “FLASHES” with AC input under-voltage (85%).
15	FLOAT CHARGE LED	“ON” during float charge.
16	EQUALIZE CHARGE LED	“ON” during equalize charge or protection charge while battery OH contact open.
17	BATTERY LED	“ON” when battery is connected. (aux-contact on)
18	DISCHARGE LED	“ON” during battery discharge.
19	BYPASS INPUT LED	“ON” with nominal bypass input. “FLASHES” when bypass is under-voltage (85%).
20	WARNING LED	Normally “OFF”. “ON” when warning displayed on LCD. “FLASHES” when AC input is abnormal.
21	FAULT LED	Normally “OFF”. “ON” when faults occur.
22	INVERTER LED	Lamp “FLASHES” during START or STOP sequence. “ON” when inverter is operating.
23	UPS LED	“ON” when the inverter output is connected to the UPS output.
24	AC OUTPUT LED	“ON” with AC output connected to the bypass/inverter sources.
25	BYPASS LED	“ON” when the bypass power supplies the load

13.1 Key-Switch and Buttons

The key-switch and operating buttons on the graphic display panel are shown in Figure 13.1. See the sections titled “Key-switch” and “Operating buttons” for each function.

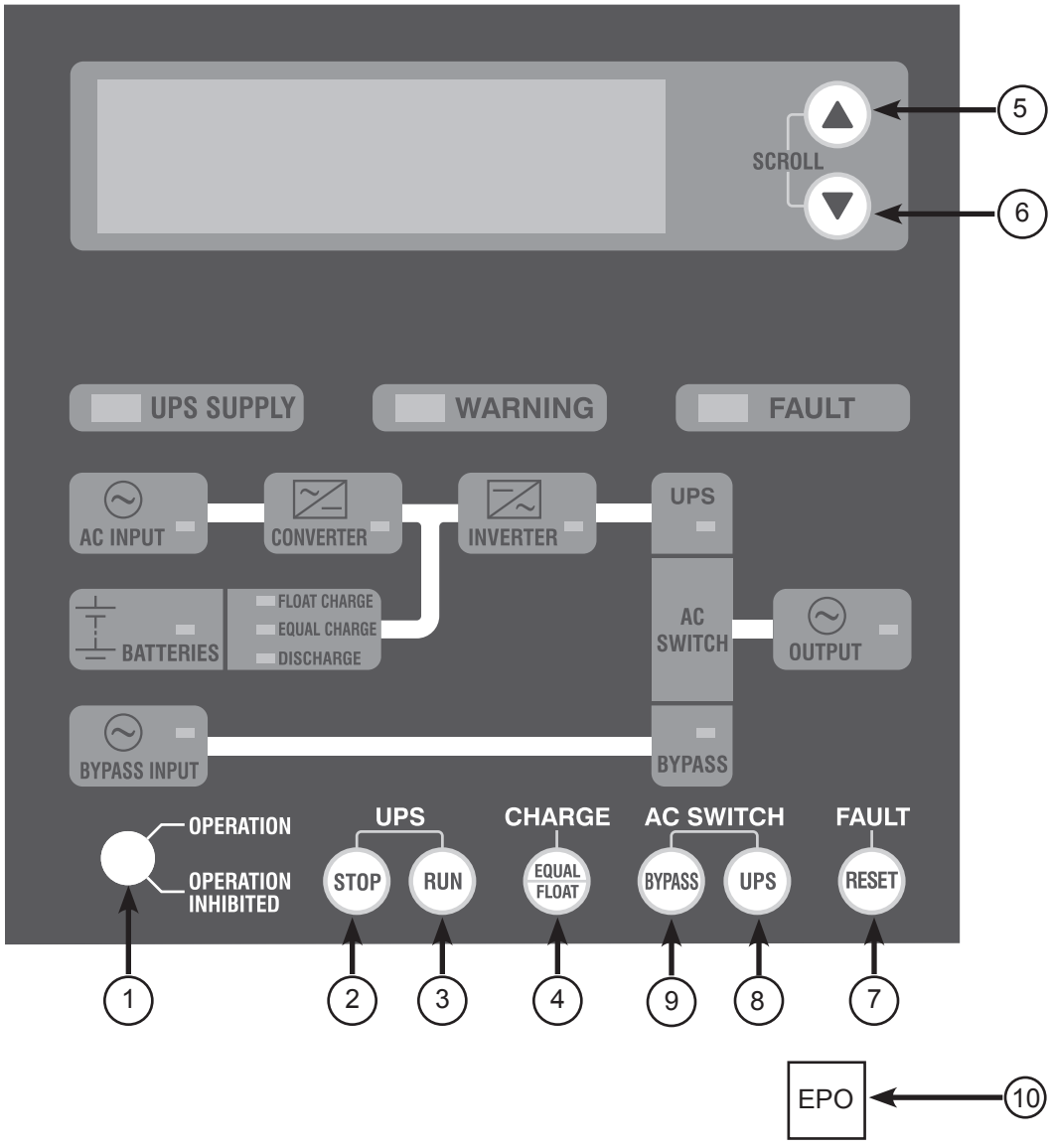


FIGURE 13.1 – GRAPHIC DISPLAY PANEL KEY-SWITCH/OPERATING BUTTONS

13.2 LCD/LED Indicators

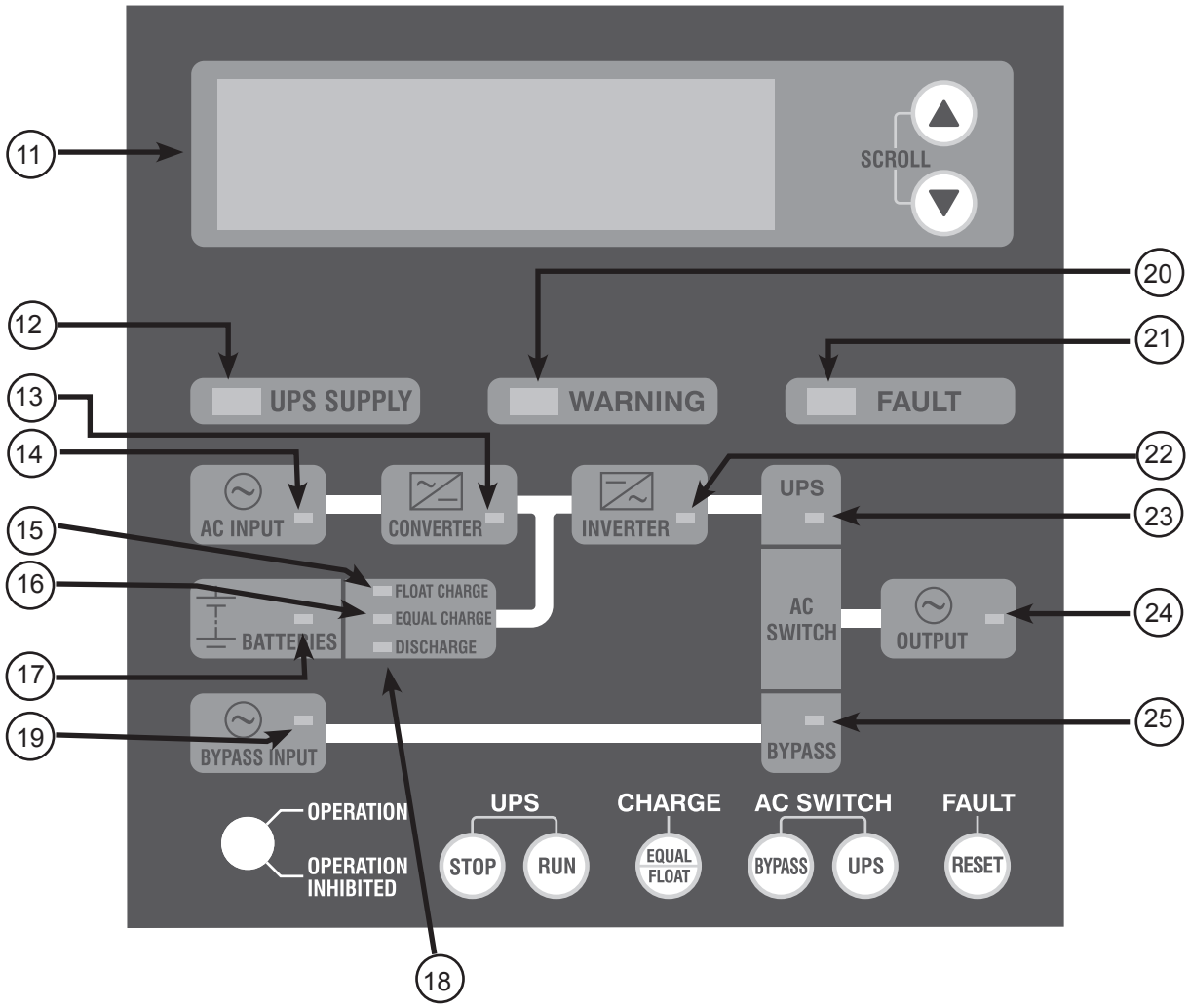


FIGURE 13.2 – GRAPHIC DISPLAY PANEL LCD/LED INDICATORS

13.3 LCD Indicators

The operator can scroll through the following LCD display screens using the scroll buttons.

TABLE 13.1 - LCD DISPLAY SCREENS

Name	Description
Normal Display	Displays operational status, operational guidance, and measured data.
Fault Display	Displays detailed data when a fault occurs.
Warning Display	Displays detailed data when a warning occurs.

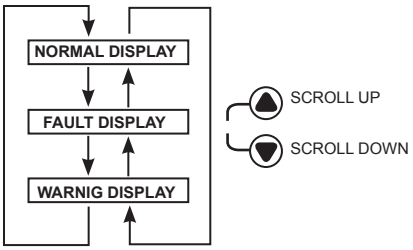


FIGURE 13.3 - CHANGING SCREENS WITH SCROLL BUTTONS

13.4 Normal Display

The Normal Display screen indicates the UPS operational status and provides various screens: an operation guidance screens, mode screens and measured data screens. Table 13.2 shows these screens page by page and illustrates the UPS Normal Display operational status screens.

TABLE 13.2 - NORMAL DISPLAY SCREEN EXAMPLES

OPERATIONAL STATUS SCREENS

BYPASS **PRESS 'RUN' SWITCH**	Shows the UPS status at the top and guidance message or measured data underneath. Shows a guidance message at start up.
UPS SUPPLY **AC-VO 208[V]** **AC- I O 50[%]**	Shows the output voltage and current after start up.
OPERATION MODE **NORMAL OPERATION MODE** **SYNC.**	Shows the UPS Operation mode.

MEASUREMENT SCREENS

O/P VOLTAGE **VOLT. 208[V]** **FREQ. 60.0[Hz]**	Output Voltage: Shows the output line-to-line output voltage.
O/P CURRENT (R.M.S.) **U 50[%]** **V 50[%]** **W 50[%]**	Output Current: Shows the RMS output current (%) for each phase.

TABLE 13.2 - CONTINUED

MEASUREMENT SCREENS

O/P CURRENT (PEAK)
U 50[%] V 50[%] W 50[%]

Shows the peak output current peak (%) for each phase.

$$\frac{\text{Peak value of output current}}{\text{RMS value for rated current x 1.41}} \text{ x 100 [\%]}$$

AC INPUT
AC I/P-V 480[V] FREQ. 60.0[Hz]

Shows the AC Input Voltage (line-to-line) and frequency.

BYPASS INPUT
BYP I/P-V 480[V] FREQ. 60.0[Hz]

Shows the Bypass Input Voltage (line-to-line voltage) and frequency. .

BATTERY
BACK-UP RATING 10[MIN] DISCHARGING 15[MIN]

Shows the remaining battery backup time with rated load and cumulative discharged time.

DC INPUT
DC-V 632[V] BATT-V 400[V] BATT- I 0[A]

Shows the internal DC bus voltage, battery voltage and battery current.

The battery current value displayed is negative during recharge and positive during discharge.

MODE COUNT
UPS 35[H] BATTERY 56[MIN] 32[TIM]

Shows the cumulative UPS operation time, the cumulative battery backup time and the number of battery backup operations.

CLOCK
TIME 03-24-06 13:58

The current time is displayed if there are no faults recorded, or after the reset button is pressed.

Date is displayed in the mm-ddyyy format. The unit does not calculate daylight savings time.

Time is displayed in the 24-hour format (e.g. 1:58 P.M. = 1358 Hrs.)

13.5 Fault Display

The Fault Display screen displays the fault records until they are reset. The Warning Display screen displays the warning records until they are reset. The fault records will remain in memory until the reset button is pressed and held for at least 5 seconds, even after the actual cause of the fault has been resolved. Note that the fault records are not deleted when the UPS is turned off.

If the UPS is RESET while the system is in:normal or bypass mode, the fault history is cleared and operation continuse.

If the UPS is RESET while the system is on backup mode, the system will power down, reinitialize, and restart.

TABLE 13.3 FAULT & WARNING DISPLAY SCREEN EXAMPLES

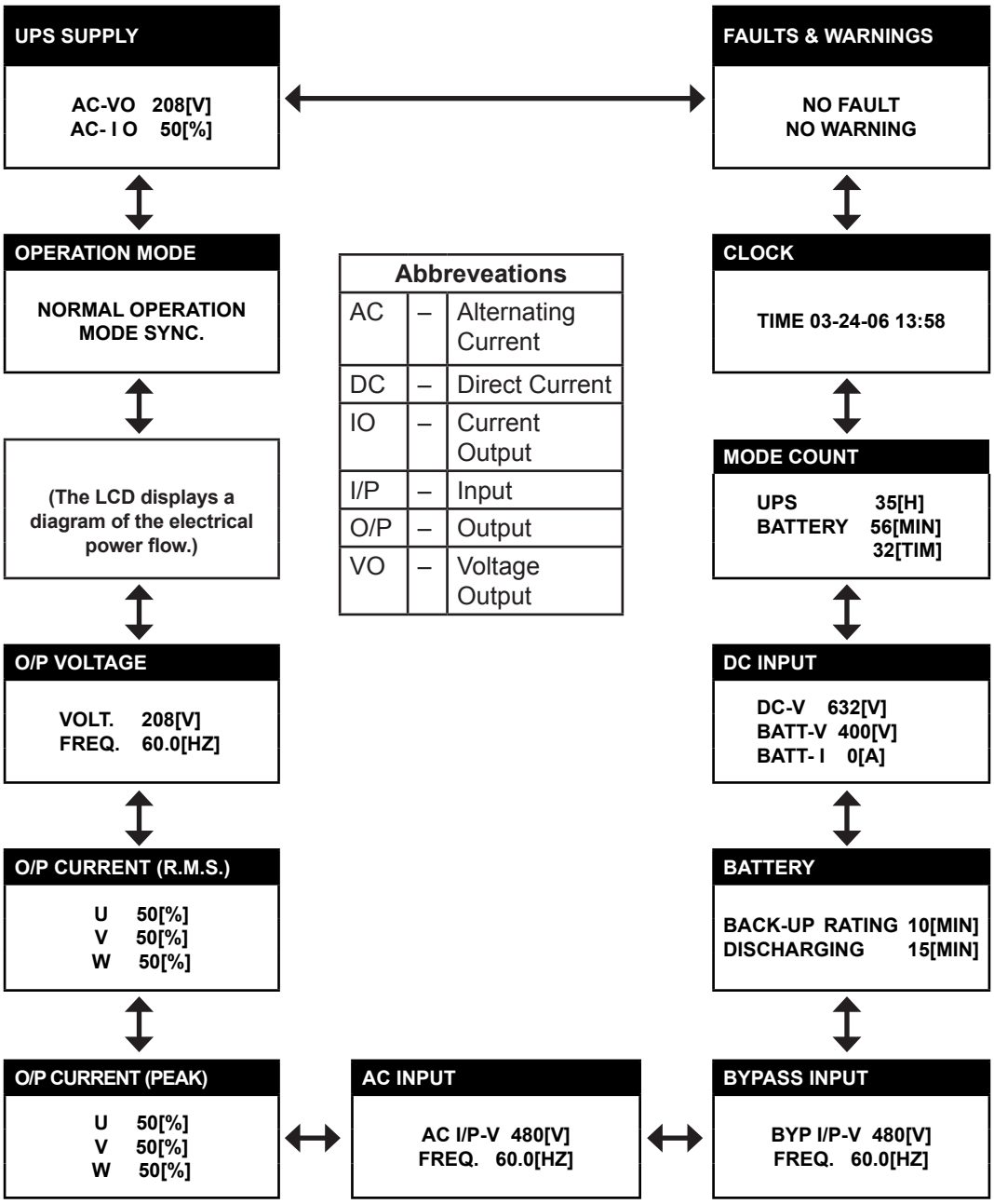
FAULTS & WARNINGS **1 FUSE BLOWN** **09-09-06 08:05:30** **↓ANOTHER ITEM**	A fault record is shown with time stamp. An arrow indicates that another record can be displayed by pressing the up/down buttons.
FAULTS & WARNINGS **1 UPS OVERLOAD** **09-09-06 08:05:30** **↓ANOTHER ITEM**	A warning record is shown with time stamp. An arrow indicates that another record can be displayed by pressing the up/down buttons.
FAULTS & WARNINGS **NO ALARM** **NO WARNING**	This screen is displayed if there are no warnings recorded, or after the reset button is pressed.

13.6 LCD Scroll

Scroll through the LCD display screens (see Figure 10.4), in sequence, using the “SCROLL UP” and “SCROLL DOWN” buttons on the graphic display panel.

- **SCROLL UP** - Moves back to the previous screen
- **SCROLL DOWN** - Moves forward to the next screen

TABLE 13.4 DISPLAY SCREEN SCROLL SEQUENCE



14 Operating the UPS

This section describes the basic procedures to operate the UPS. Figure 11.1 shows the location and functions of the operating switches to operate the UPS.

WARNING	
	If the UPS produces smoke or smells strange, immediately turn off all AC and DC input circuit breakers. Continued operation may result in fire. Contact Toshiba or Authorized representatives.
	DO NOT turn off the control power supply switch (11.1) during UPS operation. This may result in UPS faults.

FIGURE 14.1 - EPO AND CONTROL POWER SUPPLY OPERATING SWITCHES

14.1 Operation Types

The operation types are summarized below.

TABLE 11.1 OPERATION TYPES

Operation	Description
Startup	Starting up and operating the UPS.
Switch Power Supply	Switching power supply source between UPS and Bypass.
Stop	Stop the inverter and chopper/charger.
Complete Shutdown	Turn off the control power supply. Shut down the UPS completely.
Float / Equalize Charge	Changing the battery recharge mode between float charge and equalize charge.
Protection Charge	Automatic recharge mode transition from protection charge to float charge.
EPO (Emergency Power Off)	Opens up UPS input and output circuit breakers. Now power flows through the unit.

14.2 Pre-operational Check

CAUTION

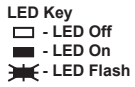
Perform the pre-operational check before operating the UPS.

Before operating the UPS:

1. Make sure all covers/panels are in place and secured.
2. Make sure the temperature in the UPS/Battery room is within specified limits.
3. Before starting the UPS, check the power source to make sure AC input power is on.
4. Make sure battery breaker's auxiliary A-contact is connected to the terminal block TB1.

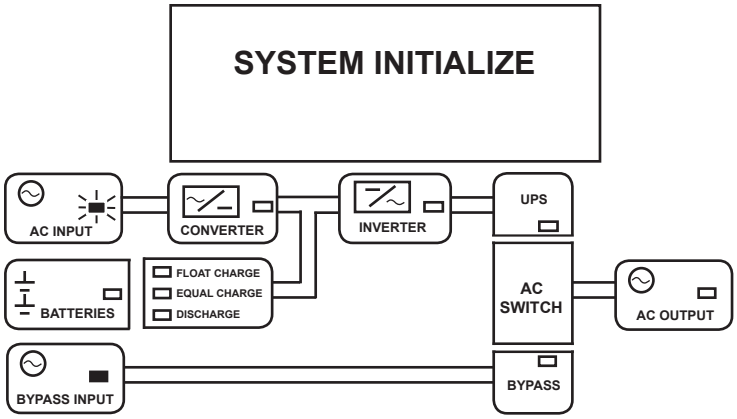
14.3 Startup Procedures

The procedure to start the UPS is shown in Steps 1-5.



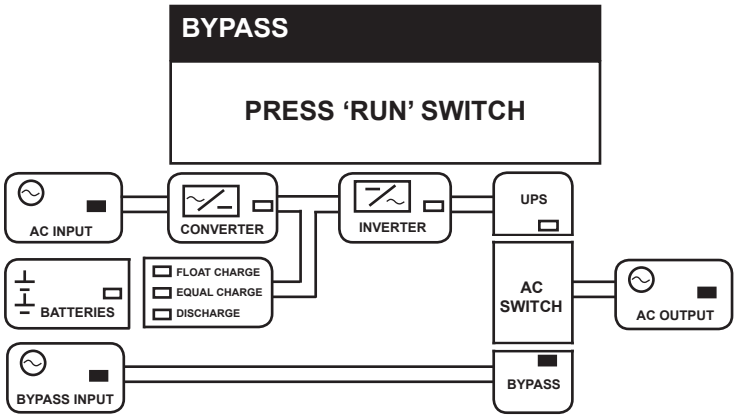
STEP 1

Turn on the control power supply switch. (Figure 14.1) and ensure the operation lock is set to OPERATION. (Figure 13.1 - 1)



STEP 2

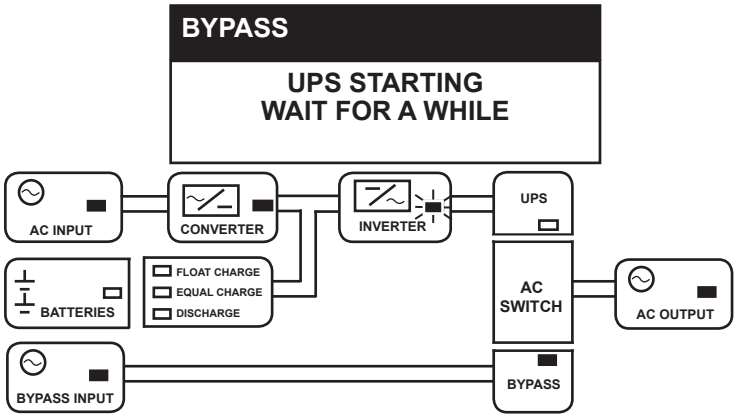
Wait for a few seconds.



STEP 3

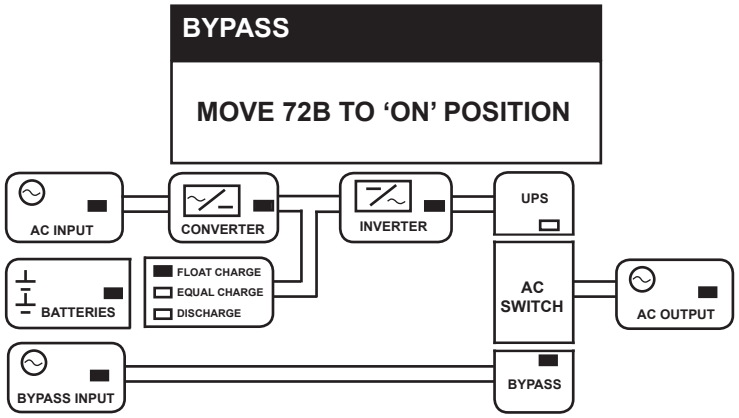
Press the "RUN" button for at least 0.5 seconds.

CONVERTER LED is "ON" and INVERTER LED flashes.



Step 4-5 continues the procedure to start the UPS.

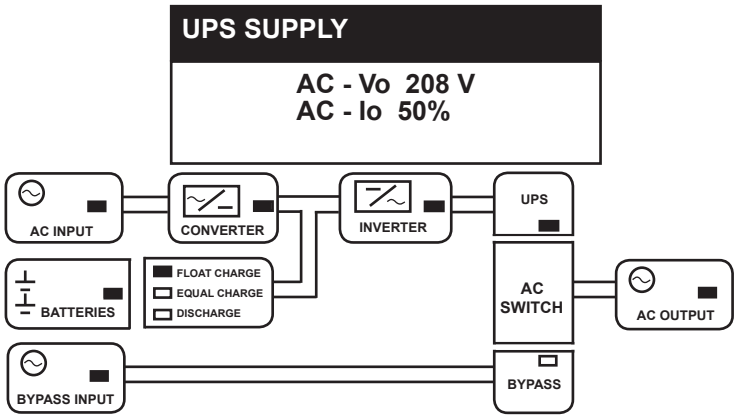
LED Key
- LED Off
- LED On
- LED Flash



STEP 4

Turn on the DC Input Breaker (72B) on the external battery cabinet.

BATTERIES LED is "ON".



STEP 5

*Press the "UPS" button for at least 0.5 seconds.This completes UPS startup procedure

BYPASS LED is "OFF".

UPS LED is "ON".

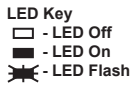
NOTE

*If the AC switch does not function, contact Toshiba or authorized representatives.

If the bypass power source is out of specification, this operation will be inhibited. In order to switch manually, press the "UPS" button for 5 seconds or more.

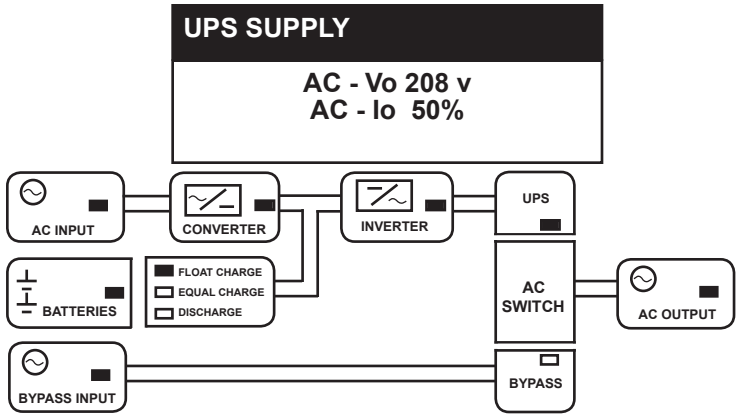
14.4 Switch Power Supply (UPS→Bypass)

The procedure to transfer between the UPS supply and the bypass supply is shown in Steps 1-3



STEP 1

Check AC INPUT LED and BYPASS LED are on to make sure power is being delivered to the UPS.

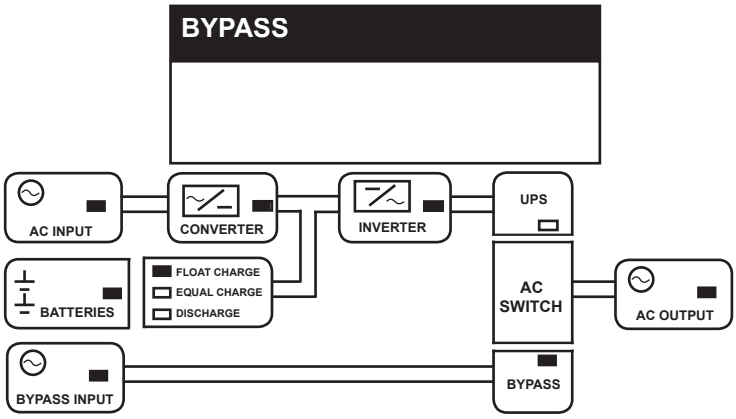


STEP 2

Press the “BYPASS” button for at least 0.5 seconds.

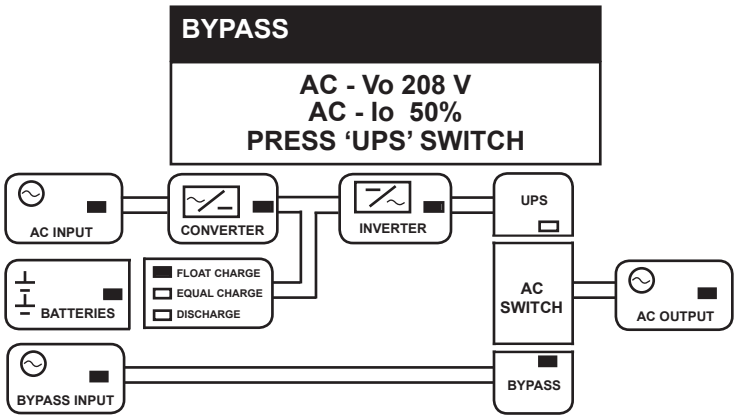
UPS LED is “OFF”.

BYPASS LED is “ON”.



STEP 3

Please wait until procedure is completed.



NOTE

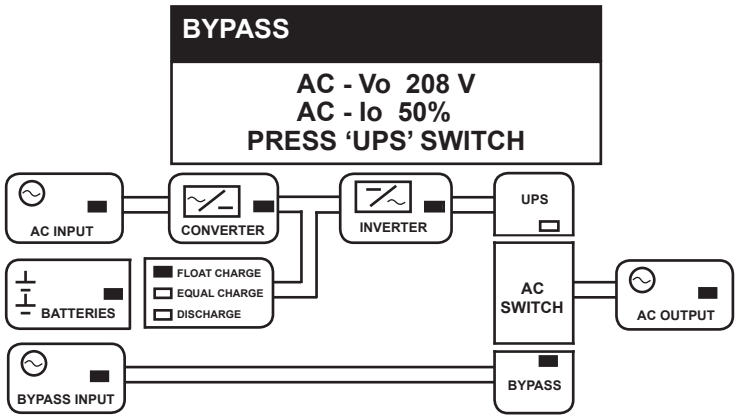
To change from Bypass to UPS supply, follow the **Startup Procedures - STEP 5**.

If the AC switch does not function, contact Toshiba or authorized representatives.

14.5 Stop

The procedure to stop the UPS is shown in Steps 1-3.

LED Key
- LED Off
- LED On
- LED Flash

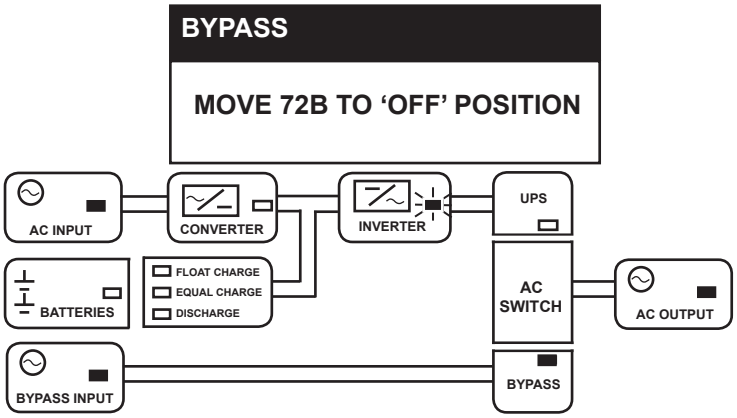


STEP 1

Transfer to Bypass supply as described in **Switch Power Supply**.

UPS LED is "OFF".

BYPASS LED is "ON".



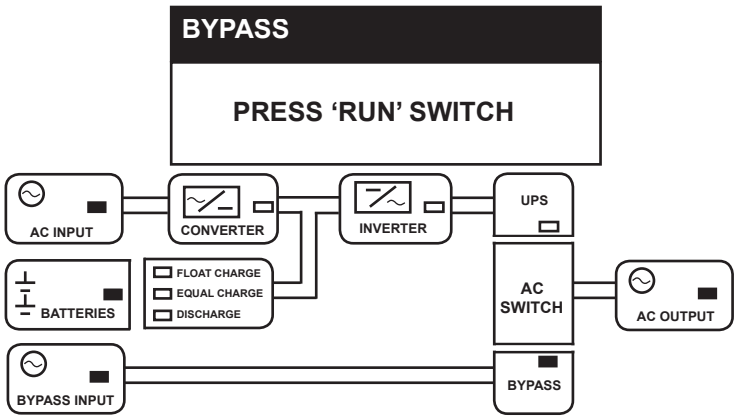
STEP 2

Turn off the DC Input Breaker (72B) on the external battery cabinet, and, press the G8000 "STOP" button for at least 0.5 seconds.

BATTERIES LED is "OFF".

INVERTER LED flashes then "OFF".

FLOAT CHARGE LED and CONVERTER LED are "OFF".



STEP 3

Wait until procedure is completed.

14.6 Complete Shutdown

The procedure to turn off the control power and shut down the UPS completely is shown in Steps 1-6.

STEP 1

Transfer to Bypass supply as described in **Switch Power Supply**.

UPS LED is “OFF”.

BYPASS LED is “ON”.

BYPASS
DC-V 0 [V] BATT-V 0 [V] BATT-I 0 [A]

STEP 2

Turn off the DC Input Breaker on the external battery cabinet, and, press the “STOP” button for at least 0.5 sec.

BATTERIES LED is “OFF”.

INVERTER LED flashes then “OFF”.

FLOAT CHARGE LED and CONVERTER LED are “OFF”.

STEP 3

Wait until procedure is completed.

STEP 4

Scroll the LCD screen to see the DC INPUT and make sure DC bus voltage is 0V.

STEP 5

*Turn off the control power supply switch (8A).

Nothing is displayed on the LCD.

All LED’s are “OFF”.

ATTENTION

**STEP 5 - This operation is different from the instructions displayed on the screen.*

Be sure to perform the procedure as specified in this manual.

STEP 6

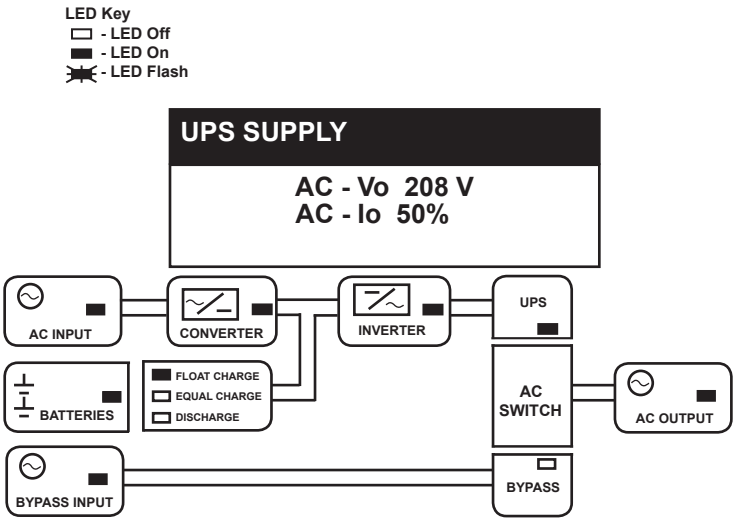
Turn off all breakers at AC output, Bypass Input and AC Output.

Shutdown is completed and UPS is isolated.

14.7 Changing Between Float Charge and Equalize Charge

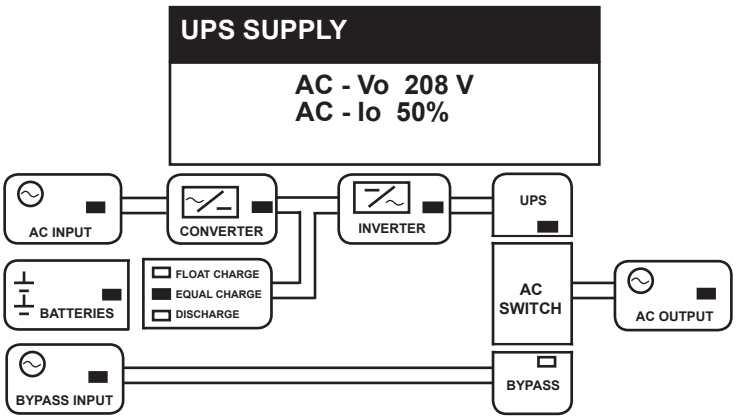
The procedure to change the recharge mode between float charge and equalize charge is shown in Steps 1-3.

See the Note below for an explanation of Flaot and Equalize charge modes.



STEP 1

Make sure that the FLOAT CHARGE LED is “ON”.



STEP 2

Press FLOAT/EQUAL button for at least 0.5 sec.

Change completed.

EQUAL CHARGE LED is “ON”.

FLOAT CHARGE LED is “OFF”

STEP 3

Please wait until procedure is completed.

NOTE

In equalize charge mode, the battery is charged for a programmed period at a specified voltage (depending on the battery spec), rather than the float charge, in order to prevent voltage deviations among battery cells. This should be done once every six months if possible.

The G8000 UPS will automatically perform the equalize recharge after battery backup operation.

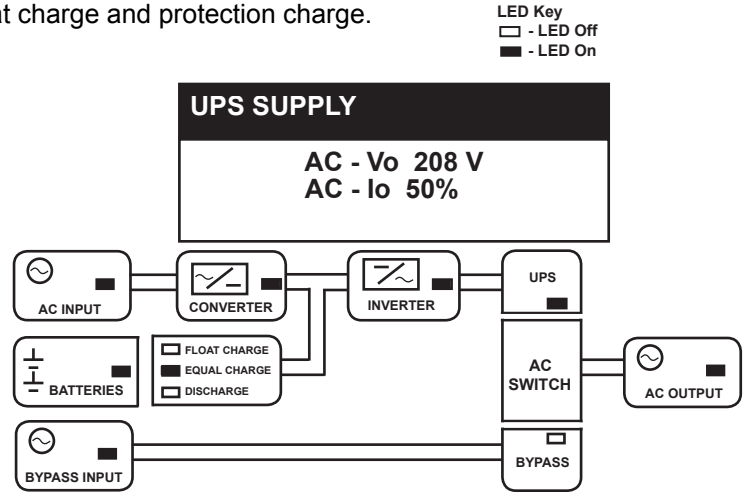
14.8 Changing to Float Charge from Protection Charge (If applicable)

The manual procedure to change from protection charge to float charge is shown in Step 1-3.This operation applies to batteries after they have experienced over temperature condition.

See the Note below for an explanation of float charge and protection charge.

STEP 1

Make sure that the FLOAT CHARGE LED is “ON”.



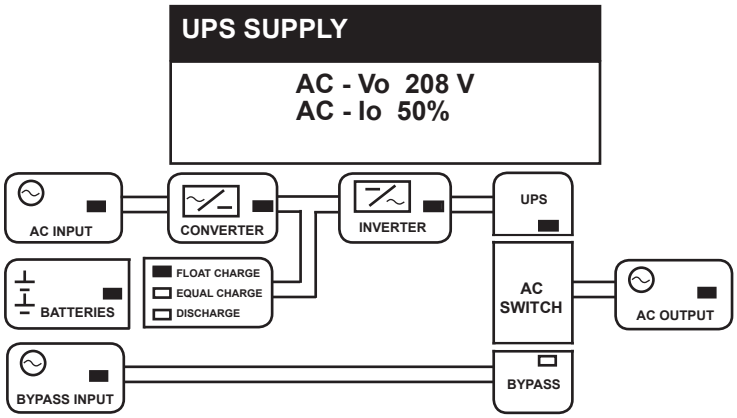
STEP 2

Make sure that the “BATT FAULT1” warning goes away.

STEP 3

Press “FLOAT/EQUAL” button for at least 0.5 seconds.

Procedure completed.



NOTE

The battery is normally being charged in float charge mode. To prevent thermal runaway of the battery, this mode will automatically be changed to protection charge when a “BATT FAULT1” (Battery over temperature) warning occurs.

In protection charge mode, the battery is automatically charged at a voltage about 5% lower than float charge.

If the “BATT FAULT1” warning message goes away and a pre-programmed duration has elapsed (about 24 hours), this mode will automatically be changed back to float charge. Thus it is not usually required to manually change the recharge mode back to the float charge.

14.9 Emergency Power Off (EPO)

Press the EPO switch for immediate shutdown of all power through the UPS. The signal from the EPO is processed as a “hard fault” by the UPS and results in gate-blocks on the transistors and opens all the internal contactors.

To Reset the UPS after triggering the EPO, do the following:

1. Shut Down the UPS as described in section 14.6.
2. Restart the UPS as described in section 14.3.

15 Troubleshooting

When an error occurs in the UPS, error data is displayed on the LCD screen. This section will describe the types of errors, the error messages displayed on the LCD screen and the procedures to correct the errors.

15.1 Types of Errors

The following types of errors may occur in the UPS:

TABLE 15.1 OPERATION TYPES

	Name	Description
Fault	Fault (Trip)	The UPS has been tripped and has stopped operating. The UPS is in Bypass mode.
Warning	Warning-1 (Input Power Failure)	Power is supplied from the battery. When the warning is corrected, power will automatically be supplied from the AC input.
	Warning-2 (Stop and Restart)	The UPS transfers to Bypass supply and the UPS stops operating. When the warning is corrected, the UPS will automatically be restarted and revert to UPS supply.
	Warning (Operation Control)	An error or a phenomena related to an error occurred. Since this problem does not directly affect operation, the system switches to synchronized mode.
	(Guidance)	An error or indication of an error has occurred, but operation was not affected.

15.2 Faults and Warnings Data Screen

This screen appears when a trip error is detected. Up to 10 screens of fault data can be displayed. Figure 15.1 and Table 15.2 show a sample screen and describe the data shown in the screen.

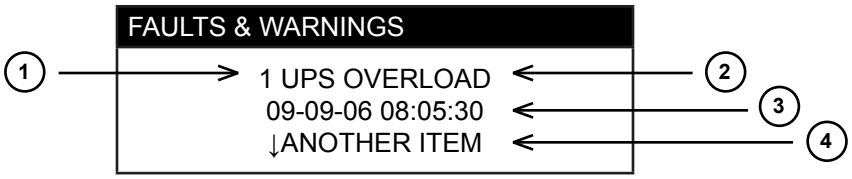


FIGURE 15.1 - SAMPLE FAULT DATA SCREEN

TABLE 15.2 - FAULT AND WARNING DATA SCREEN DESCRIPTIONS

#	Name	Description
1	Number	The number of the message in the order that it was detected (1 - 10). (Up to 10 screens of fault data can be displayed.)
2	Message	Shows the type of the fault or warning message.
3	Time	The date (mm-dd-yy) and time (in 24-hour format) the fault was detected.
4	Scroll Indicator	Indicates whether there is a fault screen before or after this screen.
		↑ Indicates there is a fault screen before this screen.
		↓ Indicates there is a fault screen after this screen.
		↑↓ Indicates there are fault screens before and after this screen.

15.3 LCD Fault & Warning Displays

When a fault occurs, a screen is shown as in Figure 15.2. When a warning occurs, a screen is shown as in Figure 15.3. Select the desired fault or warning data to be displayed using the scroll buttons.

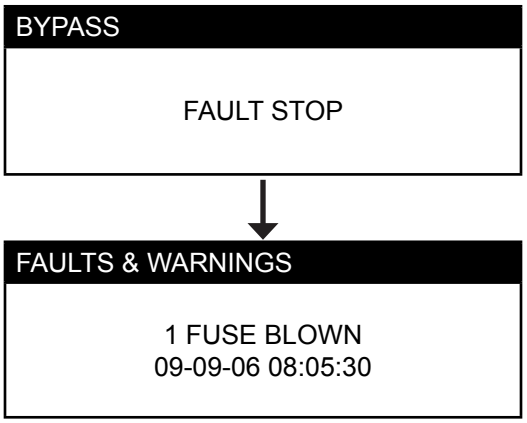


FIGURE 15.2 - FAULT DISPLAY

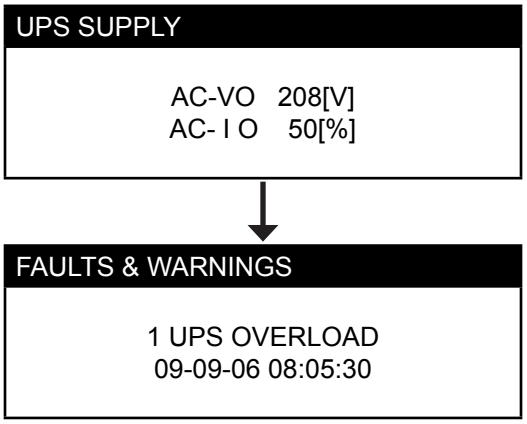


FIGURE 15.3 - WARNING DISPLAY

15.4 Fault Messages

Figure 15.4 show the corresponding circuit locations for fault detection codes. Tables 15.3 through 15.7 gives details for the fault and warning messages referred to in section 15.3. The “item” code assoiated with each fault or warning message may be used to determine the physical location of the fault or warning by referring to Figure 15.4. The UPS unit may be shipped with different protective configurations from the standard shown in Figure 15.4, if specified by the customer. See the protective configuration indicated on the single line diagram for each UPS.

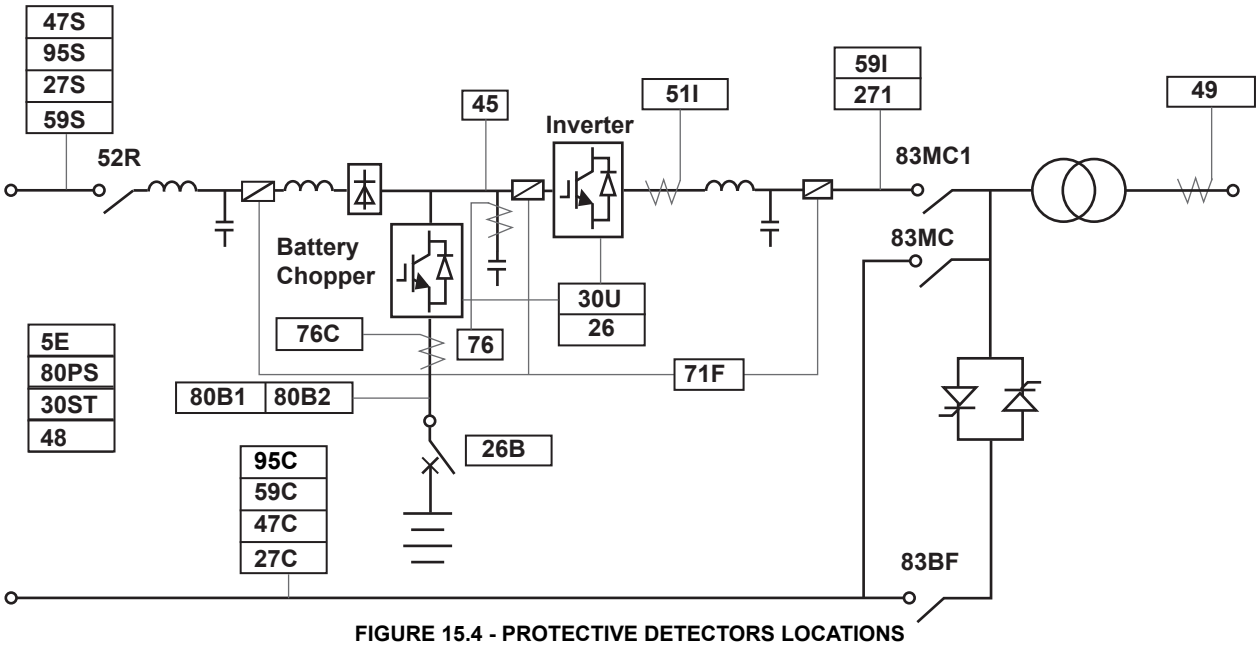


FIGURE 15.4 - PROTECTIVE DETECTORS LOCATIONS

TABLE 15.3 - FAULT (TRIP)

ITEM	LCD MESSAGE INDICATION	DESCRIPTION
26	OVER HEAT	HIGH TEMP IN THE CABINET.
30ST	(NO INDICATION)	AN ERROR OCCURRED IN THE MAIN CONTROL MICROPROCESSOR (CPU).
48	STARTUP ERR	STARTUP WAS NOT COMPLETED WITHIN THE NORMAL TIME FRAME.
5E	EMG.STOP	AN EMERGENCY STOP WAS ACTIVATED VIA THE EXTERNAL CONTACT.
71F	FUSE BLOWN	RECTAFIER, DC, OR INVERTER MAIN CIRCUIT FUSE BLOWN.
76	DC OC	DC OVER-CURRENT - EXCESSIVE CURRENT IN DC CIRCUIT.
80B2	BATT. UV	BATTERY VOLTAGE IS BELOW CUTOFF VOLTAGE.
80PS	CONT. PS. ERR	THE CONTROL POWER SUPPLY VOLTAGE FAILED.

TABLE 15.4 - WARNING – 1 (CONVERTER STOP/INPUT POWER ERROR)

ITEM	LCD MESSAGE INDICATION	DESCRIPTION
27S	AC I/P UV	AC INPUT UNDERVOLTAGE - AC INPUT VOLTAGE IS TOO LOW
47S	AC PHASE ERR	AC INPUT PHASE ROTATION ERROR.
59S	AC I/P OV	AC INPUT OVERVOLTAGE - AC INPUT VOLTAGE IS TOO HIGH.
95S	I/P FREQ. ERR	AC INPUT FREQUENCY ERROR.

TABLE 15.5 - WARNING - 2 (STOP AND RESTART)

Item	LCD Message Indication	Description
27I	AC O/P UV	AC output voltage is low.
30U	UNIT FAULT	IGBT Stack Failure.
45	DC OV	Over-voltage in DC circuit.
49	AC O/P OL	Output overload
51I	INV. OC	Inverter over-current.
59I	AC O/P OV	AC output voltage is high.
76C	BATT. OC	Over-current in Battery section.

TABLE 15.6 - WARNING (OPERATION CONTROL)

Item	LCD Message Indication	Description
27C	BYPASS UV	Bypass input voltage is low.
47C	BYPASS ERR.	Bypass input phase rotation error.
59C	BYPASS OV	Bypass input voltage is high.
95C	BYPASS ASY.	Bypass input frequency error.

TABLE 15.7 - WARNING (GUIDANCE)

Item	LCD Message Indication	Description
26B	BATT. OVER HEAT	Battery temperature is too high.
80B1	BATT. UV (ALM)	Battery voltage is near cutoff voltage.

15.5 LCD Scroll (w/ faults or warnings)

This section describes how to scroll through the LCD screens when a fault has occurred (when Fault Data screens exist).

Figure 15.5 shows the locations of the buttons to scroll the LCD screens. See Table 15.8 for detail of the scroll buttons and how they are used for screen scrolling.

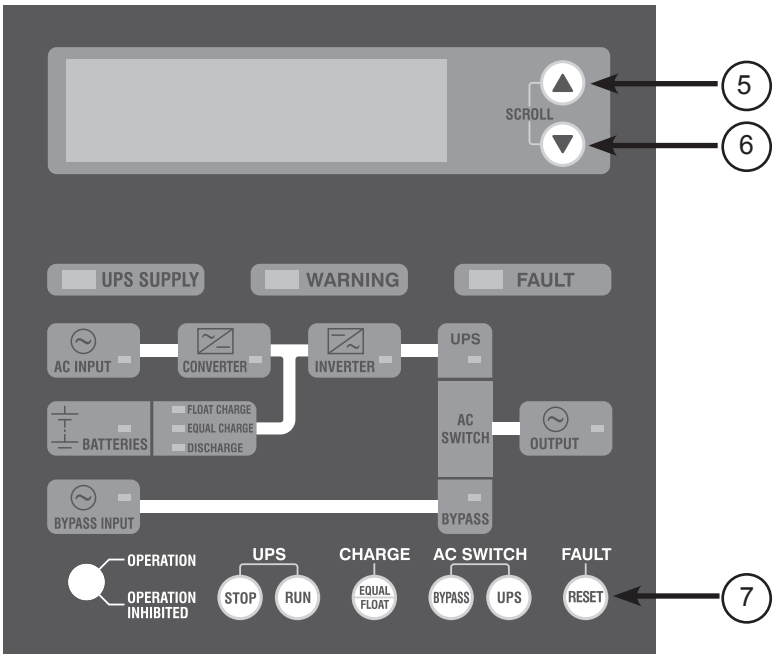


FIGURE 15.5 - POSITION OF SCROLL AND RESET BUTTONS

TABLE 15.8 - BUTTON FUNCTIONS

#	Name	Function
5	SCROLL UP	Scrolls to the previous screen.
6	SCROLL DOWN	Scrolls to the following screen.
7	RESET	Resets the UPS faults and warnings shown on the LCD and the fault history data stored in memory.

15.6 Restoring UPS Operation

WARNING

Contact Toshiba in the event of malfunction or fault.

This UPS should be repaired only by factory authorized personnel. Servicing by untrained personnel may extend the fault or result in electric shock or personal injury.

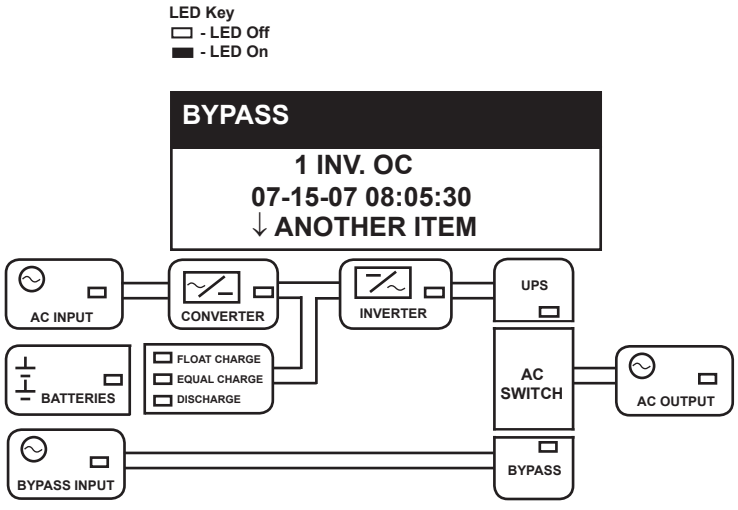
Do NOT attempt to modify or relocate the UPS.

Electric shock, personal injury or fault may result if unauthorized personnel attempt to modify or relocate the UPS. Be sure to contact toshiba customer service if you need to modifify or relocate the UPS.

Do not open the front and/or rear panels.

The parts inside carry energy-high current. Touching them may result in electric shock, burns or fault.

The procedure to restore UPS operation is shown in Steps 1-2. The example shows the UPS restored after a trip fault occurred on inverter over current with the message “INV. OC.”



STEP 1

Check the LCD screen.

Also check other fault data screens with scroll buttons graphic panel.

STEP 2

Contact Toshiba and follow the directions given by the service personnel.

TOSHIBA

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